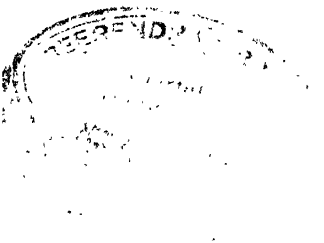

PRACTICAL ENLARGING

PRACTICAL ENLARGING.

BY

JOHN A. HODGES,

AUTHOR OF

"*Elementary Photography*," "*The Lantern-slide Manual*," *etc*

FOURTH EDITION.

GREATLY ENLARGED AND REVISED.

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WORKS COVENTRY

PREFACE TO THE FOURTH EDITION.

The publication of a fourth edition of this little handbook has afforded me the opportunity of bringing the subject matter quite up to date.

The introduction of lenses giving a flat field, and free from astigmatism, has placed a great power in the hands of those who make enlargements, and will doubtless result in the increased popularity of the process Special reference is made to the use of these objectives in the chapter devoted to the lens.

The introduction of certain new developers has also tended to simplify the process and improve its technical qualities. The special features of these developers are fully described in the new edition, and full instructions and formulæ given for their use. I have not, however, attempted to include all published methods of working, many of which are in practice far from satisfactory. No formula is given, nor any method of working described, which I have not personally thoroughly tested and proved to be reliable.

The practice of enlarging has for some time past attracted the attention of those whose aim it is to employ photography for purely pictorial purposes. Upon such the process has special claims on account of the many opportunities it affords for the exercise of personal control over the purely photographic result. For the benefit of this class I have added a chapter on "Artistic Enlargements," which I trust may be of value to those interested in this particular direction.

I would draw the attention of those who for any reason object to direct bromide enlargements to the chapters on enlarged negatives and printing therefrom, which contain full working directions for that most interesting branch of the subject.

October, 1900. JOHN A. HODGES.

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PRACTICAL ENLARGING.

SECTION I.

ENLARGING BY ARTIFICIAL LIGHT.

CHAPTER I.

PRELIMINARY CONSIDERATIONS — ADVANTAGES OF ENLARGING — COMPARISON OF METHODS, ETC.

The practice of enlarging amongst amateurs has now become very general, owing, in a great measure no doubt, to the commercial introduction of bromide paper The recognition which pictures so produced constantly receive at the various exhibitions and competitions is a sufficient answer to those who seek to challenge the artistic and technical merits of enlarged photographs. A *properly-executed enlargement* is, in the opinion of the writer, often preferable to a direct print, and in some cases is undoubtedly superior. But the great advantage which a knowledge of enlarging confers upon the amateur lies in the fact that he is thereby enabled to dispense with the discomfort, inconvenience, and expense of working a large-

sized plate direct; for, provided with a small, light, compact camera and half-a-dozen slides, he can walk further and obtain subjects which he probably would not attempt to grapple with if using large apparatus. There are some who take exception to an enlargement because they assume that it will be less sharp than a direct photograph; but, putting aside altogether, for the moment, the question of the desirability, from an artistic point of view, of obtaining microscopic definition in a photograph of large dimensions, the fact remains that a 12 × 10 enlargement from a quarter-plate negative, taken with an aperture of f/8, will possess greater sharpness and depth of definition than will be found in a direct print from a 12 × 10 negative, taken with a lens constructed to cover that size plate and working at the same aperture. The explanation of this apparent paradox is due to the fact that the depth of focus and defining power of lenses are much greater in small short-focus instruments than in large long-focus ones. Thus, a quarter-plate lens of 6in. focus, of the ordinary rectilinear type, will give greater depth of focus, definition, and flatness than will one of twice that focal length, each lens being used upon a plate of the full size which it is intended to cover. Indeed, in order to obtain approximately the same amount of depth and definition with the latter, it will probably be necessary to stop down to f/22 or thereabouts. Of course, such a procedure will, in

many cases, render the use of an instantaneous shutter an impossibility, and thus it will be seen that working a short-focus lens on a small plate will, at times, enable subjects to be taken that could not be attempted with a long-focus lens and a large camera, and this solely on account of optical difficulties, and not from the mere physical inconveniences of weight and bulk.

Again, on the score of economy, the practice of making small negatives with a view to their subsequent enlargement has much to recommend it. There are some to whom expense is a matter of secondary importance; but they are, unfortunately, in the minority, and, to the great majority of those who practise photography as a hobby, economical methods of working will have strong claims. To such, therefore, I would say emphatically, "Buy a small camera and enlarge your small negatives." What shall be its exact dimensions to some extent will depend upon circumstances, but it certainly should not exceed the popular half-plate. Personally, I have a strong predilection in favour of the 5×4, a size not very popular in this country, though very generally used in America, where it has, to a great extent, superseded the quarter-plate. Its chief advantages are that it is sufficiently large to make a very presentable direct print, and that it conveniently enlarges to two diameters on a 10×8 plate without sacrificing its proportions

Enough has probably been said on behalf of enlarging to make out a strong case in favour of its right to exist as one of the most valuable methods of picture making open to photographers. The various modes of working, and the different processes in vogue, I shall endeavour to describe in their proper places in succeeding chapters, and after perusing them it will be for the reader to decide what particular process and mode of working best suits his own requirements. For my own part, I much prefer to make an enlarged negative, and from that to print by the process most suitable to the subject, but generally on home-sensitised rough Whatman paper, toned with either platinum or gold. I unhesitatingly give utterance to the opinion that prints so produced are incapable of being discriminated from those obtained on similar rough surfaces from direct negatives.

The first point the reader will have to decide before taking up the practice of enlarging will naturally be, whether he shall employ daylight for the purpose, or whether he shall resort to the employment of artificial light. The two methods will be fully treated in succeeding chapters, and it may be fairly said that each has its advantages and its disadvantages. By adopting artificial light one is at once independent of daylight, and work can be carried on in the evening. On the other hand, there is a decided advantage when using daylight in the sharpness of the results, unless the optical

arrangements, *i.e.*, the condenser and objective, are carefully selected and suitable for the purpose; and it is a significant fact that, notwithstanding its variable quantity, many professional enlargers employ it in preference to artificial light

CHAPTER II.

General Principles of the Artificial Light Method—Mechanical and Optical Construction of Apparatus, Optics, Lenses, Illuminants, etc.

The general principle involved in the construction and use of an apparatus for enlarging by artificial light is to be found in the ordinary optical lantern, and, indeed, under certain conditions, hereafter to be noted, the optical lantern itself will serve to produce enlargements. Briefly, an enlarging apparatus consists of (1) the body or containing chamber, (2) the source of light, (3) the condenser, and (4) the objective or projecting lens.

(1) *The Body.* The purpose of the body is to contain the source of light, and to form a support for the optical system. Its size will, of course, be determined by the diameter of the condenser which is to be employed. It should be constructed of metal, and preferably, on account of its great durability, of the material known as Russian iron, or of stout sheet tin; it may be provided with an outer covering of wood, but such an addition would be a refinement rather than a matter of practical utility. Its shape is immaterial, so long

as proper provision for efficient ventilation is provided, but at the same time care must be taken to so trap all air inlets as to prevent the leakage of white light.

(2) *The Source of Light.* The selection of a suitable illuminant is a matter which will probably perplex the reader more than anything else connected with the setting up of an enlarging apparatus. There are many systems from which to choose, the chief of which, for the guidance of those not familiar with the subject, I propose briefly to describe.

I mention first of all the electric light, but only to dismiss it as being beyond the reach of the majority. Where it can be obtained, however, it will be found to be the best of all methods of artificial illumination. The most suitable form in which to employ it is the arc lamp; and there are now several forms of lamps to be obtained which will be found to give a fairly steady light. Good results are also to be obtained with the incandescent electric light, but the photometric value of the latter is far less than the arc light.

After the electric light, for general efficiency come the various forms of limelight, and those who are acquainted with its use should, without hesitation, adopt it for enlarging purposes. Preference should be given to the employment of the mixed jet, which gives a small and intense light, those being the conditions to be aimed at. The

blow-through or safety jet will also answer well, as will the older form of burner known as the oxy-calcium or spirit jet, in which the flame of a spirit lamp takes the place of the house gas or hydrogen. It is, however, somewhat troublesome to manage.

Among the low intensity illuminants acetylene deservedly takes front rank. It gives a brilliant and very actinic light, and if a properly constructed generator is employed appears to be safe. But its long range of explosibility when mixed with air in varying proportions naturally suggests that extreme caution should be observed in its employment. A special form of burner provided with a very small nipple is required for its combustion; two of these, fitted so that the flat sides of the flames are parallel with the condenser, and with an opaque diaphragm in front, with a ¾in. oval opening, placed about 1in. from the flame, will be found to give exceedingly satisfactory results.

Personally, when I cannot use limelight, I prefer to employ the Welsbach system of incandescent gas. Some writers have spoken unfavourably of this illuminant in comparison with oil, but a very extended experience induces me to recommend it without hesitation. It is said, and truly, that the large size of the illuminant results in loss of light, but the same objection applies equally to the multiple wick lamp. But what the incandescent gas loses in intensity as compared with oil it gains in colour, for it is much more actinic. The new form

of burner, which dispenses with a chimney, will give the best results in the enlarging lantern, and is to be preferred to the usual pattern. The great advantage of incandescent gas over oil is its cleanness, easy adaptability, good colour, and (comparatively) its absence of heat.

It may be interesting to those who cannot command a supply of gas from the main to learn that the Welsbach Co. have applied their system to a patent lamp, burning paraffin, with perfect success, the light being nearly equal to that obtained with gas. This form of light could be easily adapted for use in the enlarging lantern.

Next, in point of utility, come the various kinds of lamps in which petroleum or other mineral oil is burnt. The lamps generally supplied with commercial enlarging lanterns are of the parallel wick type, commonly met with in the ordinary optical lantern used for projection purposes. These are furnished with from two to five wicks, and, if properly constructed, give a light of great intensity; but, though admirable for ordinary projection work, they are not so suitable for enlarging as they would at first sight seem to be. This form of lamp appears to be at its best when provided with but three wicks, the addition of a greater number not seeming to increase materially the brilliancy of the light or its intensity, and certainly greatly increasing the tendency to smoke, besides introducing other disturbing influences which are better elim-

inated: for equality of illumination and sharpness of image can only be secured when the source of light itself is both small and intense. If oil is to be employed, I believe the best results will be obtained when using an ordinary burner of the Argand type, about one inch in diameter, with a deflecting cone. This will be found to give better definition and greater sharpness than the ordinary parallel wick lamp of the shops, although the illumination may not be quite so powerful.

If a more powerful light of this class is desired, then the Mitrailleuse burner will fulfil all requirements, if the size of the flame be reduced by putting an opaque screen with a hole ¾in. in diameter in front of it.

While upon this subject a word or two upon the proper use of an oil light may not be out of place. The amount of light to be obtained from any oil lamp will depend to a great extent upon the care and skill of the operator in using it. There are some people who will obtain twice as much light from an ordinary three-wick lamp as will others, but attention to the following points should ensure good results. In the first place, it is most essential that good oil only be used; the best kerosene, costing about 1s. per gallon, will be found most suitable. If pure, it should be free from odour and without colour. The wicks must also be of good quality and clean. A dirty or soiled wick will prevent the free flow of the oil through it, and the

flame will consequently be badly supplied with fuel. The performance of the lamp will depend also in a great measure on the proper trimming of the wicks. I find for this purpose that a razor answers better than scissors. The wick should be clean cut, and perfectly parallel with the top of the wick chamber; if the corners are cut, the tendency of the flame to fork at its extremities will be greatly reduced. After lighting, the flame should first be turned down low, and the wicks gradually raised at intervals of a few minutes, until the maximum of light, short of smoking, is obtained.

The careful worker may deem these hints superfluous, but I have, in many instances, traced failures to their neglect. Some operators advise the addition of camphor to the oil, but my own experience shows me that, although the luminosity of the flame may be somewhat increased, any slight advantage in this respect is more than counterbalanced by the increased tendency to smoke. And, moreover, the dissolved camphor is quickly absorbed in the loose fibres of the wicks, which consequently quickly become clogged. The apartment in which the lantern is in use should be efficiently ventilated. It is astonishing what an effect this has upon the performance of an oil lamp. I once had occasion to give a demonstration illustrated by a few diagrams, and took my "Pamphengos" lantern down to the hall for the purpose. I found, to my surprise, that the lamp, which had burnt splendidly

the night before at home, would not give sufficient light to project an ordinary slide, and no amount of coaxing improved its burning. But upon taking the lantern to an adjoining apartment the lamp at once burnt with its usual brilliancy, proving that its defective performance was due to an insufficient supply of oxygen in the atmosphere—a condition of things brought about by the crowded state of the room, and insufficient provision for the admission of fresh air.

At first sight it would seem that coal-gas would provide us with a ready and convenient means of illumination, but a perfect gas-lamp suitable for enlarging or projection purposes yet remains to be invented. The luminosity of ordinary gas may be increased by causing it to be impregnated with carbon on the principle introduced by the Albo-carbon Light Co. The albo-carbon light itself can be used, or the modification of it suggested by Mr. Traill Taylor, which consists of two fish-tail burners mounted with their flat surfaces facing the condenser, and with a diaphragm in front to cut off the margin of the flame and so curtail its dimensions. I have not tried this burner myself, but the fact of its having been introduced by Mr. Taylor is sufficient warranty for its suitability for the purpose. I have, however, used Argand burners of several types, which, when supplied with enriched gas, have given good results.

Having now, I believe, described almost every

method of illumination which could be applied to the purpose in view, and pointed out the merits and demerits of each, it will be for the reader to determine which system best meets his own requirements, and in making the selection he will, of course, to a great extent be governed by circumstances. The limelight will strongly commend itself to those who are accustomed to use it in connection with the optical lantern, and if compressed gas in bottles be employed, the materials for its production are ready for use at a moment's notice. After this, in point of utility, I should be inclined to put the incandescent gas light previously described, then an efficient oil lamp, and, lastly, gas.

(3) *The Condenser* It now becomes necessary to consider that portion of the optical system of an enlarging apparatus commonly called "the condenser," and it will perhaps be useful to study briefly the object which it is intended to serve. Its function is to collect the rays of light which emanate from the lamp or other source of light, and project them through the negative which is to be enlarged. In fig. 1 we have a representation of what occurs when we seek to dispense with the use of a

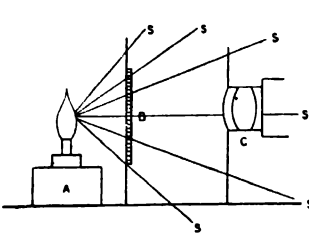

FIG. 1.

condenser, A being the lamp, B the negative, and C the enlarging lens, the lines SSS representing the rays of light proceeding from the lamp. It will be seen not only that a large number of rays

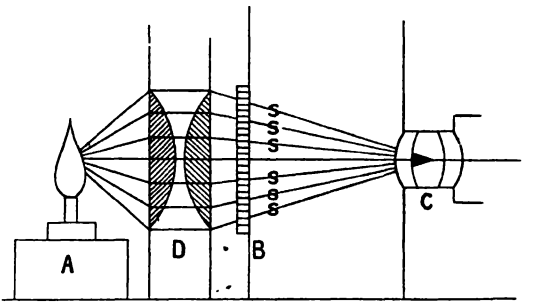

FIG. 2.

do not pass through the negative at all, but of those which do only a small proportion reach the enlarging lens itself. When, however, a condenser D is interposed we have the result shown in fig. 2, the hitherto scattered rays are refracted, that is to say, caught up and bent, and caused to pass through the negative and in the direction of the objective, thus causing the former to be brilliantly and evenly illuminated.

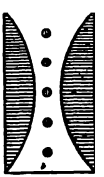

FIG. 3.

The form of condenser now almost universally adopted by opticians consists of two plano-convex lenses mounted in a cell, with their convex surfaces nearly touching, as shown in fig. 3. The glass of which they are

constructed should be as nearly colourless as possible, and free from striæ or air bubbles, as the presence of such defects would probably cause distortion of the image. Various complex systems of condensing lenses have been from time to time devised, but such systems are costly, and the slight advantage to be gained would not warrant the amateur in adopting them. The condenser must be of sufficient diameter to include within its circumference the whole of the negative.

To ascertain the diameter of a condenser for a given negative, lay the latter on a sheet of paper, trace its outline with a pencil, draw a diagonal line from corner to corner, and then from the middle of this line describe a circle. This will give the size of condenser required for any negative up to that particular size. In selecting a condenser, see that the lenses are quite loosely mounted in the cell, otherwise they will probably fracture when they become heated. The cell itself should have holes drilled in it, in order to allow of the rapid condensation and dispersion of any moisture which may condense on the inner surfaces of the lenses.

(4) *The Objective or Enlarging Lens.* Speaking generally, it may be said that any lens that will take a photograph will also serve to enlarge it, but, at the same time, the selection of a suitable lens is a very important matter, inasmuch as it will, to a great extent, influence the quality of the

enlargement itself. A good lens is absolutely essential to successful working, and the greatest care should be exercised in choosing it; therefore, unless the reader is fully competent to discriminate between good and bad, he should seek the assistance of someone possessing the necessary knowledge. Whatever be the form of lens employed, if the best results obtainable are desired, its focus should be long in comparison with the plate to be enlarged. Attention to this rule will ensure flatness of field in the enlarged image, and, consequently, good marginal definition.

A portrait lens is usually recommended for enlarging, and most commercial enlarging lanterns are provided with lenses of that type, probably on account of its rapidity. Although it may be used with its full aperture when enlarging from a portrait or single figure, yet when it is required to enlarge a group or landscape where good marginal definition is essential, it becomes necessary to stop down considerably before the desired result is obtained, but it will be apparent that in so doing the chief advantage of the lens, namely, its rapidity, is sacrificed.

For all-round work a lens of the so-called "rapid" type is most suitable. When a short exposure is imperative it may be used with its full aperture, and is then not much behind the portrait lens in point of rapidity, while its flatness of field and defining power are superior. To obtain the finest

results, the lens used, whatever its type, should be, as I have said, capable of covering a plate larger than that from which the enlargement is to be made. For instance, if the original negatives are quarter-plates, the lens used to enlarge them should be a half-plate. The reason for this rule is not far to seek. The field of all lenses constructed prior to the introduction of the modern anastigmats when working with large apertures (a condition which usually obtains when enlarging) is only flat in the centre, and therefore it will be apparent that in using a long-focus lens to enlarge a small plate we shall be utilising only the best and flattest portion of its field, securing thereby greater sharpness and better marginal definition in our enlargements.

If enlargements of the highest technical quality as regards definition are required it becomes essential to use a lens of the modern flat field non-astigmatic type both for taking the original negative and subsequently for making the enlargement from it. The introduction of these lenses has placed a power in the hands of the practical enlarger which he did not previously possess, for by their aid, and given the necessary manipulative skill, it is now quite possible to make enlargements which, as regards detail and sharpness of definition, are equal to large prints from negatives taken direct.

It would perhaps be almost invidious to mention particular instruments when there are now so many excellent ones from which to select, but it may be noted that if artificial light and a condenser are to be employed it becomes necessary to use an objective of sufficiently large diameter to allow the cone of rays from the condenser to pass through, otherwise much light will be lost. For lantern use, therefore, the Stigmatic (portrait type) of Dallmeyer, or the Cooke triplet (portrait type), would prove magnificent instruments. If diffused daylight is employed the choice is less restricted, and a lens of smaller diameter may be employed. In my own practice I use with complete satisfaction a Ross-Zeiss convertible anastigmat, and also one of the new Ross symmetrical anastigmats; the latter is an excellent instrument and reasonable in price. The remarks with regard to the necessity for employing a lens of large diameter with artificial light apply, of course, equally to objectives of the ordinary type.

CHAPTER III.

How to Make an Enlarging Lantern.

The enlarging lantern of the shops is, necessarily, rather an expensive piece of apparatus, and probably the economically-minded photographer, who possesses the necessary mechanical ability, and who understands the use of tools, may, not unnaturally, prefer to construct one for himself. I therefore propose to devote the present chapter to a description of the construction of a simple but efficient form of enlarging lantern which I once constructed for my own use. The dimensions which I shall give are suitable for a condenser 6in. in diameter, and, of course, if a larger or smaller condenser is employed, they must be modified accordingly, although the general lines of the construction will be the same. The diameter of the condenser will be determined by the size of the negatives which are to be enlarged, as already described. If this be done for a quarter-plate it will be found that a condenser of 5½in. diameter will just suffice, but experience shows that much better results are gained by allowing a little margin, and therefore it is that I recommend the adoption of the 6in. lens. A large condenser is a costly article, but one suitable for the purpose

should be obtainable for about 25s., or, if second-hand, probably for less.

I wish to preface these instructions with a few words of caution. It matters not how rough the general construction of the apparatus may be, provided one point be attended to, namely, the absolute parallelism of all the parts, for if any part be in the slightest degree "out," good results can never be obtained. By this I mean that the light must be properly centred, and the condenser, the stage carrying the negative, and the woodwork carrying the objective, must all be absolutely parallel with each other.

A piece of well-seasoned pine or mahogany, 1in. thick, 9in. broad, and 2ft. 6in. long, must be obtained to form the base. On its under side, at each end, fillets of wood 1in. square are to be screwed, a row of holes ¾in. in diameter being bored out at the letters AAA, etc., in fig. 4. These are to afford ventilation. Mark off a line at B with a T-square, 12in. from the end at which the holes are bored. Now select a sound piece of mahogany, about 1½in. thick, 9in. broad, and 12in. long; upon this lay the condenser, mounted in its cell, quite centrally, and with a pencil carefully trace its outline. The marked portion is then to be carefully cut out with a keyhole saw. Into the hole so made the condenser should just

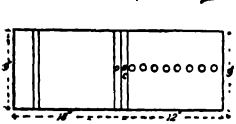

FIG. 4.

fit firmly. This will form the front of the lantern proper and may now be carefully screwed down to the baseboard at the line already marked at B. The sides are to be constructed by mortising together four pieces of pine or mahogany about 1in. thick, an opening 6in. square being left in the centres for the doors; the outside dimensions of these sides will be 12in. by 12in. When finished they are to be glued and screwed to the baseboard and front. The doors should be made of three pieces of wood clamped to prevent warping, and should be hinged at CC, and open outwards.

Before making the top, the reader must decide upon his illuminant. If he elect to employ the limelight or gas, then the roof may consist simply of a stout piece of tin, in the centre of which a hole has been bored, and over which a piece of stovepipe, provided with a cap to prevent the escape of light, has been fitted. If, however, he employ a lamp of the usual three-wick type, he may dispense with the chimney, as the lamp itself is provided with one, but a slit, wide enough to allow the lamp chimney to move freely backwards and forwards, must be cut in the roof to allow of the necessary adjustment and centring of the lamp. When the lantern is in use, and the light has been centred, the portion of the slit in the roof not occupied by the chimney must be covered with a strip of tin to exclude stray light.

At present we have left the back of the lantern quite open, so that we may have free access to the interior of the lantern to manipulate and attend to the light, but provision must also be made for preventing the escape of white light into the room while the enlargement is being made. To effect this, a curtain will be found far more convenient than a door. We therefore screw on the top of each of the sides three screw-eyes, as shown at AAAAAA in fig. 5. A piece of stout brass wire is then taken and bent round to the form of the top of the lantern. A double thickness of black twill suspended by small rings from this rod will, when the rod is pushed up close to the lantern, effectually prevent white light from escaping. When it becomes necessary to manipulate the lamp, the rod with the curtain may be completely removed by simply pulling it out of the eyelets.

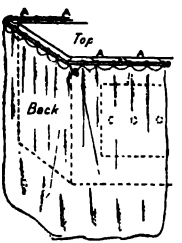

FIG. 5.

We have now to turn our attention to the front portion of the enlarging lantern. Mark off at C on the baseboard (fig. 4) threequarters of an inch in front of the upright carrying condenser, another parallel line, and screw down a second piece of 1in. wood, 9in. broad, and 12in. high, which has had an opening cut out of its centre corresponding to the previous one but 7in. in diameter instead of 6in. (D, fig. 4). A third piece of wood of the

same dimensions, but without the hole, will form the front. This last, however, must not be screwed down, but two brass runners, to be procured from any camera maker, should be attached to the bottom, the bent edges of which can work in narrow grooves, which should have been previously made in the sides of the baseboard with a "plough" plane. When fitted together the front should move rather stiffly, so as to allow of a rough adjustment of the enlargement, the final focussing being effected by means to be described later.

A bellows capable of expanding to about 18in. must now be procured and glued to D and E. A frame on the principle of an ordinary carrier must now be made to hold the negative in position for enlarging at C (fig. 4). Narrow fillets of wood will have to be glued inside the bottom portion of the lantern body to support a false bottom made of stout tin, in which two rows of holes, as shown in fig. 5a, have been punched. The height of this false bottom from the floor can only be ascertained by experiment, as it will depend upon the shape and construction of the lamp employed. When the apparatus is finished up to this stage (the objective, of course, having been screwed on to the front), the lamp may be lighted, but in all probability the illumination of the disc will be very

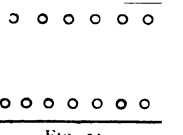

FIG. 5A

unsatisfactory; the lamp must therefore be raised or lowered until an evenly-lighted disc results; the position of the false bottom can then be marked, and the fillets glued and screwed in, when the lantern will be ready for use. I should have said that before gluing the bellows to the front carrying the objective, a hole should have been cut exactly in the optical centre, and the flange of the objective screwed on.

As photographic lenses are now very seldom fitted with focussing racks and pinions, some other provision for focussing must be devised. The cheapest plan is to take the lens to a working optician, and ask him to fit to it a "jacket flange." This is a flange with a cloth-lined jacket, into which the lens slides easily, thus permitting the focussing of the image to be accurately performed. An alternative but more expensive method of attaining the same result would be by fitting the sliding front of the enlarging lantern with a rack and pinion. The whole apparatus should now receive two coats of Tyler's black, when, if the instructions have been properly carried out, the reader will be in possession of a thoroughly effi-

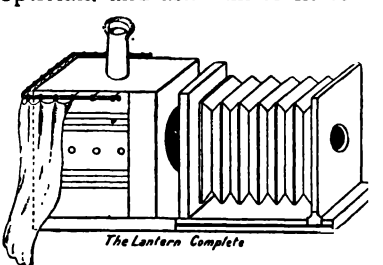

FIG 6

cient enlarging lantern, capable of doing all that can be done with an apparatus costing pounds instead of shillings. The complete lantern is shown in fig. 6.

CHAPTER IV.

Enlarging by Artificial Light without the Employment of a Condenser — Various Methods.

There are other methods of enlarging by artificial light to which I have not yet adverted, which dispense with the costly condenser, some of which give excellent results—the chief disadvantage being that the exposure is necessarily very considerably longer than when a condenser is employed. The idea is to strongly and evenly illuminate a translucent substance, such as a piece of opal glass, in front of, and nearly in contact with which, the negative to be enlarged is placed, the projecting portion of the apparatus being similar to that found in enlarging lanterns in which a condenser is employed.

The original suggestion was, I believe, due to M. Hutenet, who exhibited a lantern constructed upon similar lines before the Photographic Society of France. If the reader prefer to employ this method, he may follow the general lines of construction described in the last chapter, and it will not be necessary to go over the same ground again. The baseboard and the front portion of the lantern,

therefore, can be constructed according to the direction there given, but the lantern body proper will have to be made somewhat differently. In this case, on account of the great heat necessarily evolved by the illuminating system, the body must be constructed of metal—either Russian iron or stout sheet tin. The economically minded may procure from the grocer or oilman one of the tins in which glycerine is stored. These are about twice the size of an ordinary biscuit-box, but much more strongly constructed, and will admirably answer the purpose to which we intend to apply them.

An opening A (fig. 7) must be cut out on one side, a little larger in dimensions than the negatives to be enlarged, and on the outside two strips of tin BB bent to form a groove must be riveted; these will form the supports for the opal glass. Holes must be punched in the bottom for the purposes of ventilation, which must be trapped in the manner already described, and a portion of the back or side cut out to form a door to allow of the proper manipulation of the light. Now comes the question

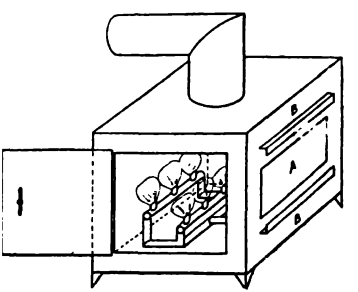

FIG. 7.

of illumination, and after making several experiments I have come to the conclusion that, where it can be obtained, gas forms the best illuminant. As I have before said, the object is to illuminate the negative as evenly and brightly as possible, and the best means of doing so is to have made at a gasfitter's a fitting constructed on the lines indicated in fig. 8. It consists of seven small burners arranged in two tiers, one slightly above the other, forming practically when lighted a thin wall of flame. As the heat given out by such a system is very considerable, ample provision must be made for ventilation by providing a sufficient number of holes at the bottom of the lantern to freely admit cool air, and making the chimney at the top sufficiently large to carry off the products of combustion rapidly. Where gas cannot be procured, paraffin may be used as a substitute by arranging a series of flat flame burners in a row, but the result so obtained is not so perfect as when gas is employed, the difficulty of obtaining even illumination being much greater. Extreme care also must be taken to prevent heating of the reservoir containing the oil, or an explosion might ensue.

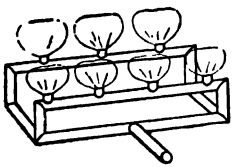

FIG. 8.

The back of the lantern should be provided with a reflector, larger in dimensions than the negatives to be enlarged from, so that as much light

as possible may be utilised. A piece of the silvered corrugated glass or metal, similar to that used in Chappuis's celebrated reflectors, will answer admirably (fig. 9). The heat evolved from this lantern, however, is such as to cause great discomfort to the user, and may even be sufficient to fracture the negative.

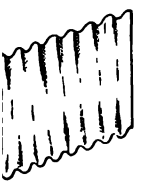

FIG. 9.

A further modification of this system was once described in an almanac, in which, instead of the rows of oil or gas jets, the writer recommended the employment of a Belge lamp, screened with an ordinary opal globe, as the illuminant. I have not tried this method, but should suppose that with fairly small negatives it would give good results. The margins of the plate, however, would probably not be so evenly illuminated as they would be by the method I have just described.

Perhaps the simplest and cheapest method of enlarging by artificial light without a condenser is the following, the credit of which appears to be due to Mr. Armstrong, who, some time since, described the apparatus in the *British Journal of Photography*. The principle is based upon that found in the aphengescope, an optical instrument sometimes employed for the projection of images of opaque objects upon a screen. A reference to the diagram (fig. 10) will easily enable the reader to understand its construction. AA is a chamber of suitable dimensions, which may be

constructed either of metal or wood, though in the latter case it will be advisable to line the interior

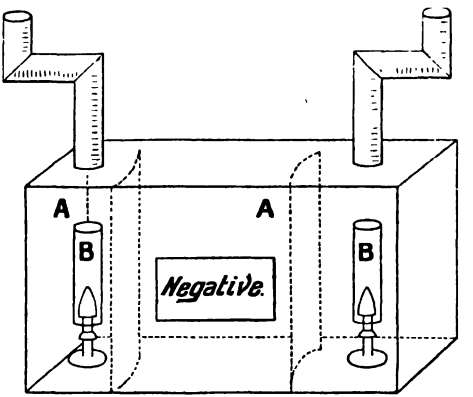

FIG. 10.

with asbestos on account of the heat; the back is formed of a pure white smooth surface, which is strongly illuminated by two lamps BB placed on either side of the negative in the front of the chamber. It is obvious that such an arrangement might easily be adapted to the ordinary daylight enlarging camera described in Chapter VI., which in that way would be available for both day and artificial light. Either gas or lamp light may be employed, or, if very short exposures are required, the limelight. Two Welsbach incandescent burners give, perhaps, the best results, their light being highly actinic. In any case a metal shield should be adjusted round each light so as to prevent any

direct rays from passing through the negative, which, it will be seen, is brilliantly illuminated by the white background. In the event of a daylight enlarging camera not being available, it will be necessary to provide a baseboard five feet long, on which slides an upright screen, to which is attached the lens; a second screen sliding in the same grooves will serve as a focussing screen. The space between the negative and the screen carrying the lens can be covered with a piece of black twill during exposure, so as to prevent any fogging from diffused light.

Except that the exposures required are longer, I regard this method as equal to any in which condensers are employed, and the apparatus itself is far less costly and simpler to construct. Working with the full aperture of a rapid rectilinear lens, and using rapid bromide paper, the exposures vary from thirty seconds with a thin negative to from two to ten minutes with a dense one, the degree of amplification being four diameters. A careful inspection of fig. 10 will render further description unnecessary, and that given should enable anyone easily to construct the apparatus.

Another modification of the gridiron arrangement previously described, in which magnesium ribbon is employed, has been recommended and described by Mr. Richardson in "Photography Annual" for 1892 (p. 255). The ordinary daylight enlarging camera can be utilised. The illuminating

arrangement consists of a wire framework supported by a wooden base. Upon the wire strands of magnesium ribbon are hung about an inch apart, a sheet of groundglass being interposed between the ribbon and the negative. A piece of white cardboard forms an admirable reflector. It is not necessary that all the strands should be ignited simultaneously, for with ordinary care unequal illumination is not likely to occur. With negatives that are not unduly dense this method succeeds fairly well.

Although I have included the foregoing description of methods of illumination which dispense with the use of a condenser, it must not be supposed that I advocate their employment. On the contrary, I consider that with the possible exception of the reflected light method attributed to Mr. Armstrong all are open to grave objections, and can at the best only be regarded as imperfect substitutes for a condenser. Those workers who do not care to incur the expense of a properly fitted enlarging lantern are advised to adopt the daylight method of working, which is at once simple and inexpensive, and requires practically no outlay in special apparatus.

SECTION II.

Enlarging by Daylight.

CHAPTER V.

How to Enlarge in an Ordinary Room.

Having described the distinctive features and actual construction of an apparatus for enlarging by artificial light, it now becomes necessary to consider the requirements of those who prefer to work by daylight. It may be said at once that where the necessary time can be spared daylight affords the easiest and cheapest mode of working, for, if a room can be devoted to the purpose, very little in the way of special apparatus will be required. Broadly speaking, there are two methods of working when employing daylight, that is to say, either by blocking out all white light excepting that passing through the negative and making the room itself serve as a huge camera, or by employing a specially-made enlarging camera. I propose to describe each method, merely premising that the last-named has some advantages in point of convenience where much work has to be done, or where the dark room is small, or other work has to be carried on in it.

The room selected should be preferably in the upper part of the house, and have a north, or north-east, aspect, for then as little interruption from the sun's rays as possible will occur. Where such an aspect cannot be secured, and sunlight falls direct upon the window, provision must be made for diffusing the light by the interposition of a piece of finely-ground glass; care must also be taken to avoid the shadow of any intervening object being cast upon the negative while enlarging, or unequal illumination will result.

If the apartment be not already fitted up as a dark room, all white light should first be blocked out. The easiest way of managing this is to have a wooden frame made the size of each window, if there be more than one, over which should be tacked coarse canvas, which in turn must be pasted over with stout brown paper, such as is commonly used for placing underneath carpets. A couple of "buttons" screwed into the sash frame will keep these frames firmly in position, and will enable them to be quickly removed when not in use. An ordinary deal table about 5ft. long should be procured and placed directly underneath the window at which the enlargements are to be made (A, fig. 11.), or, instead of a table, a bench made of two or three boards secured together with cross-pieces, and supported on trestles, may be used, or if a special enlarging easel, such as will hereafter be described, running on rails, be

preferred, both table and bench may be dispensed with.

In describing this mode of working it will be useless to specify exact dimensions, as they will necessarily vary in every case. About a foot

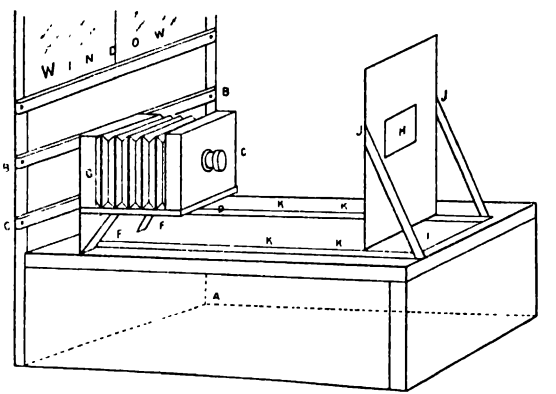

FIG. 11.

above the table or bench a strip of wood 3in. wide must be screwed to the frame, and also a similar one about twelve inches above the first, as shown at B B and C C in the figure. These will serve as supports to which the enlarging camera is to be affixed. The portion of the canvas and brown paper backing marked D (fig. 11) can now be cut out, and a piece of ½in. board, 11in. wide and 18in. long, screwed to the centre of the lower cross-piece at E, this shelf being strengthened by struts F F underneath. A frame

of ½in. wood, 12in. square and 2in. deep, is to be screwed to the window end of the shelf, as shown at G, four strips of wood having been glued inside to form a support for the negative carriers which are to fit inside. Two other frames, of exactly similar dimensions to the one just described, namely, 12 × 12 × 2, must also be made, one of which is to be covered on one side with thin wood, preferably mahogany, so as to form a kind of tray. These will form respectively the back and front of the enlarging camera, and they may now be connected by gluing in a cloth bellows, the method of making which is described in Chapter VI. A hole is cut out exactly in the centre of the front tray-shaped piece, and the flange of the lens which is to be used attached.

To make the easel, a common deal drawing-board, 36 × 20, is obtained (H, fig. 11), a piece of the floor boarding, 20in. long, being screwed to one end, as shown in figure at I, to form a support, it being further strengthened by struts J J behind. As I have previously mentioned, it is very essential that the easel be kept parallel with the lens and the negative, and, to ensure this, two fillets of wood K K, 1in. square, should be screwed down to the bench or table, 20in. apart, so that the easel may travel on its support rather stiffly between them.

To use the apparatus the negative to be enlarged is placed in its carrier *in situ*, the lens being screwed on at B; the enlarged image will then fall

upon the easel, which should have had pasted over it a sheet of pure white paper in order to facilitate the operation of focussing. The degree of amplification of the enlarged image will depend upon the distance between the lens and the negative. The nearer the lens is approached to the negative the greater will be the magnitude of the enlarged image, and the further will the easel have to be removed from the lens. At the end of this chapter a table will be found showing the relative distances of the lens from the easel, and from the negative, for use with lenses of different focal length. The operation of focussing will be rendered easier if a square hole be cut out of the centre of the drawing-board, and a piece of finely-ground glass let in, flush with the front surface, as shown in the figure.

TABLE OF ENLARGEMENT AND REDUCTION.

Focus of Lens in inches.	Times of Enlargement and Reduction.										Focus of Lens in inches.
	1	2	3	4	5	6	7	8	9	10	
4½	9 9	13½ 6¾	18 6	22½ 5⅝	27 5⅖	31½ 5¼	36 5⅐	40½ 5 1/8	45 5	49½ 4½	4½
5	10 10	15 7½	20 6⅔	25 6¼	30 6	35 5⅚	40 5⅞	45 5⅝	50 5⅓	55 5½	5
6	12 12	18 9	24 8	30 7½	36 7⅕	42 7	48 6⅞	54 6¾	60 6⅔	66 6	6
7	14 14	21 10½	28 9⅓	35 8¾	42 8⅖	49 8⅙	56 8	63 7⅞	70 7⅗	77 7 7/10	7
7½	15 15	22½ 11¼	30 10	37½ 9⅜	45 9	52½ 8½	60 8⅐	67½ 8 7/16	75 8⅓	82½ 8¼	7½
8	16 16	24 12	32 10⅔	40 10	48 9⅗	56 9⅓	64 9 1/7	72 9	80 8⅘	88 8⅘	8
8½	17 17	25½ 12¾	34 11⅓	42½ 10⅝	51 10⅕	59½ 9 1/12	68 9⅐	76½ 9 1/16	85 9⅘	93½ 9 7/10	8½
9	18 18	27 13½	36 12	45 11¼	54 10⅘	63 10½	72 10⅐	81 10⅛	90 10	99 9 9/10	9
10	20 20	30 15	40 13⅓	50 12½	60 12	70 11⅔	80 11⅐	90 11¼	100 11 1/9	110 11	10

CHAPTER VI.

The Daylight Enlarging Camera—How to Construct It.

The alternative mode of working is by employing what is known as an enlarging camera. Its chief advantage over the method just described is that it can be used almost anywhere, in any room, or even out of doors; it also comes in very handily for copying purposes, and is, moreover, available for making lantern slides. It is rather a costly piece of apparatus to buy, but as its construction presents no great difficulty to anyone able to use ordinary carpenter's tools, I propose to give a few practical directions for making it at home.

The general form of the enlarging camera is shown in fig. 12. It consists really of a large

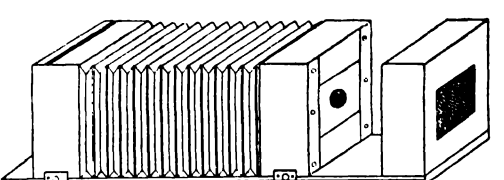

Fig. 12.

camera provided with a long baseboard and bellows, so as to allow of considerable extension. The bellows is divided into two compartments, as

it were, by an adjustable partition which carries the lens, the extreme front portion of the camera containing a carrier to hold a negative to be enlarged.

The first thing to be done is to procure a single-back, such as is ordinarily used for the wet-collodion process, of dimensions sufficiently large to hold plate or paper of the size the enlargement is intended to be. It will be best, for obvious reasons, to build the camera too large rather than too small. I would suggest, therefore, 15 × 12 as a convenient size, though, of course, a larger or smaller one may be chosen; my own takes plates 12 × 10. Such a dark slide may be generally met with at the second-hand dealer's for about 10s. or 15s., according to its condition, and, if possible, the focussing screen should be bought with it. Very frequently old cameras are to be met with at pawnbrokers, or in sale rooms, and, if one can be obtained cheap, it should be secured, as it would serve as a basis for operations, and save a good deal of time in constructing the apparatus.

We will assume that a 15 × 12 slide has been procured, the outside dimensions of which are 17 × 14. Some clean, well-planed floor boarding must also be obtained. This is generally about an inch thick and five inches wide. One piece 19in. long and two pieces 14in. long are cut off and glued and nailed together as shown at fig. 13. This will form

the back of the camera, and the dark slide should just fit in comfortably. A fillet of wood ¾in square is glued to one end, as shown at C C C C, to keep the slide in position. Another piece of the floor boarding 17in. long is then to be nailed and glued in to form the top, sufficient space being left at D D to allow of the easy insertion of the dark slide, which may now be temporarily placed in position, four additional fillets of wood being glued inside at E E E E. We have now the back of the camera with a groove formed by the fillets to hold the dark slide and the groundglass screen.

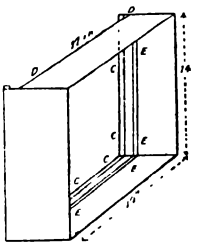

FIG. 13

Two additional frames of precisely similar dimensions, but without the groove, are then to be constructed of the same materials. The first of these will form the central portion of the camera, on which the lens is to be placed. This is shown in perspective at fig. 14. We may, if we please, entirely board in the front, and having done so, find the centre, cut out an opening sufficiently large for the lens, and screw on the flange. It will, however, be found extremely convenient in practice to be able to change the position of the lens, and thereby

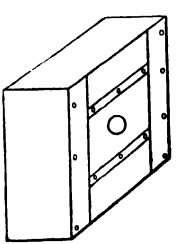
FIG 14.

alter the position of the enlarged image on the plate. To effect this a cross-motion front will be necessary, the construction of which it is hardly necessary to describe in detail; the fronts usually slide in rebated grooves. but a simpler and equally effective method is shown in section at fig. 15. The third frame, which will form the front of the enlarging camera, is now taken in hand. Some one inch fillets are glued in a quarter of an inch from the front, as at G G G G in fig. 16; against these fillets the carrier holding the negative to be enlarged will rest.

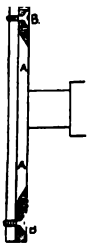

FIG 15.

The baseboard must now be constructed For a camera of the dimensions we are considering this should be at least six feet long, and it may also be constructed of planed floor boards. Its width must be equal to that of the camera proper, namely, 19in. A ¼in. groove is to be made down each edge with a plough plane. The woodwork of the camera is now complete, and will be ready for the insertion of the bellows.

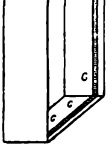

FIG 16.

The making of the bellows, although apparently difficult, is really an exceedingly easy matter, but rather tedious. Procure some common twill lining from the draper's and some brown carpet paper. The outside dimensions of the bellows when completed will be 16in. by 13in., and it should be

capable of extending to about 5ft. We shall, therefore, want a piece of material for folding 5ft. 6in. by 4ft. 11in, and shall have to join several pieces of the brown paper together to form one sheet that size. Some good but thin paste is then made, and the black twill is pasted down on the paper until it is completely covered, overlapping at the joins as little as possible. It must not then be disturbed until it is dry, which may take twenty-four hours. It is then turned over, and the reverse side is covered in a like manner with the cotton lining. When it has dried it is ready to fold. All these operations, by the way, will probably be most readily performed on the floor, unless a table sufficiently large for the purpose is available. A piece of tailor's chalk is taken, and the pasted material is accurately marked out as shown in fig. 17. Fold the material at the marks, and well press each fold with a stout bone paper-knife. Having done so, again open out

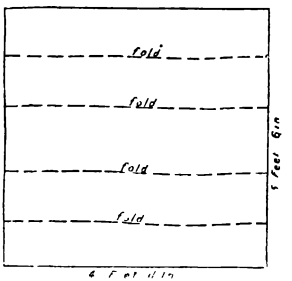

FIG. 17

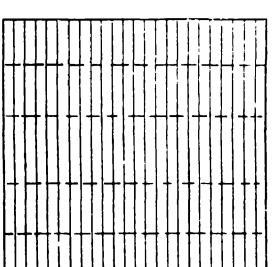
FIG. 18.

the material, and mark parallel lines with the chalk, as shown in fig. 18, at right angles to the lines previously made. The exact number of folds cannot be shown in the diagram, but each fold should be about 1¼in. deep. The bellows may now be folded at these lines, exactly as one would fold a paper fan or a concertina—one fold up, the next fold down, care being taken to well press each fold. When the folding is finished, stretch out the bellows and bend round at right angles, and commence to nip each fold at the angle between the finger and thumb. When one side is done, the remaining three sides must be treated in the same way.

The operation is a simple one, though extremely difficult to describe; a glance at the ordinary bellows on one's camera will show how the folds should be made more graphically than a long description We have allowed an inch for overlapping; some thin glue is applied to this, the two pieces brought together, rubbed down, and the bellows is complete. When dry it may be glued to the back and front portions of the camera. We have, as yet, made no provison for focussing. A rack and pinion, or a winch screw, may, of course, be fitted, but I find in practice that it is far easier to focus with the simple sliding motion. Two brass plates, with turned-up edges, one fitted with a screw nut to clamp the camera when the focus is

arranged, can be procured from a camera maker, and screwed to the sides in such a manner that the turned-up edges slide easily in the groove which has already been made on the edge of the baseboard. The front portion of the camera is to be fitted in a precisely similar way. The whole of the camera may now receive a coat of dead black, and is virtually complete It is better. though not imperative, to cover in the space between the lens and the negative, so as to only allow the light passing through the latter to reach the former. A secondary bellows may be employed to effect this, or an easier plan would be to tack a piece of black velvet to the front portion of the camera which holds the negative, which, when the necessary adjustment of the camera has been made, can be pulled over the portion holding the lens, thus excluding extraneous light.

The camera is now complete, and the way I use mine is to place it at an angle against a window facing north, so that the direct light from the sky is utilised. This mode of working renders focussing easier and considerably shortens exposure.

In order to avoid using carriers in the dark slide, to take different sized plates and paper, I procure a piece of glass (patent plate, if possible) the full size and cement it inside the slide, and upon this I lay the plate or paper which is to be exposed. A piece of felt the size of the glass

superimposed on the plate or paper will keep it from slipping during exposure. This will, of course, throw the focussing screen out of register to the extent of the thickness of the glass used in the dark slide, and the necessary adjustment must be made. If the glass used in the slide and the groundglass are of the same thickness, this may be easily done by simply reversing the focussing glass and turning its ground face outward. This will also render focussing a more easy matter. It might be thought that causing the enlarged image to pass through a sheet of glass in the manner suggested might result in disturbing the chemical focus or achromatism of the lens. This, however, does not occur in practice, and, although I invariably work in this way, I never find the slightest falling off in the sharpness of the enlarged image, and the convenience of so working is extremely great.

CHAPTER VII.

Accessory Apparatus and its Construction—The Easel, Large Trays, Dark-room Lamp, Carriers, etc.

In describing the darkened room method of working, directions were given for making a simple form of table easel for holding the sensitive paper during exposure, but, if much work has to be done, the employment of a properly-fitted enlarging easel becomes, if not an actual necessity, at any rate a very great convenience. This, like almost every other requirement of the photographer, is a purchasable commodity, for easels embodying every possible facility for ease in working are now to be obtained from the various dealers in apparatus.

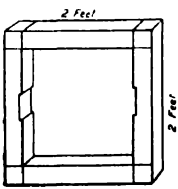

Fig. 19.

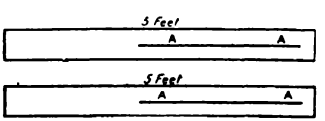

Fig. 20.

Those, however, who prefer to make their own may easily do so by following these instructions.

Some smoothly planed pine 3in. × 3in. in dimensions is procured, and a mortised frame 2ft. square is made as shown in fig. 19. Two pieces of 1in. board, 5ft. long and 6in. wide, are then to have a long slot cut ⅜in wide and 2ft. long as shown in fig. 20 at A A. These are to form the uprights, and should be screwed to the base at B B (fig. 21), side struts being added to give strength as at C C C C. This will form the framework and support for the easel, which should be made of pine, smoothly planed, and clamped like an ordinary drawing-board to prevent warping. Its width should be such that it just fits closely between the two uprights. Two large camera screws put in the sides will enable it to slide up and down the grooves in the uprights for the purpose of adjusting the image, and will also afford a swing back motion, which will often be found useful to bring any desired portion of the enlargement into sharper focus.

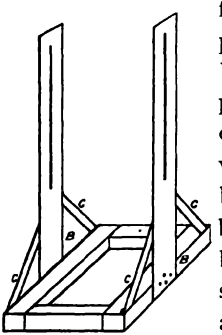

FIG 21.

As before indicated, the various portions of the apparatus must be quite parallel, and the best mode of keeping the easel so is to mount it on runners which run upon rails screwed to the floor. The rails and wheels may be obtained from any furnishing ironmonger, and are commonly used for the sliding

doors, which, in modern houses, have now largely taken the place of the old-fashioned folding doors. This permits of the easel being readily adjusted to an approximate focus, the final focussing being effected by moving the lens. The best way of attaching the sensitive paper to the easel is to procure some stout elastic band about an inch wide, and tack strips along each edge of the backboard: the paper can then be slipped underneath these, and will be firmly held in position for exposure without the aid of drawing-pins.

Several large trays for developing and washing will form an indispensable portion of the practical enlarger's equipment. For developing purposes glass or ebonite dishes are most suitable, though both, in the larger sizes, are rather costly. For washing the enlargements, porcelain or wooden trays or dishes are extremely convenient; glass-bottomed trays with wooden sides are easily constructed. Some straight grained pine, free from knots, about ⅜in. in thickness and 2½in. deep, is procured, and a rebate ⅜in. deep cut out as shown in fig. 22. Four strips of this must be cut for each tray of dimensions suitable for the size of the enlargements; for instance, 16 × 13 for a 15 × 12 paper. These must be carefully nailed together to form a tray with a rebate running round the bottom, into which a piece of sheet glass is to be carefully

FIG. 22

then form a rebate to prevent the negative from falling through, two small brass turn buttons serving to hold it in position. A good coat of dead black, when the glue is dry, will finish the carrier. If carriers are required for use in the dark slide, they can be made in a precisely similar manner.

CHAPTER VIII.

THE NEGATIVE, CHARACTERISTICS OF—DEFINITION —EXPOSURE—DEVELOPMENT—NATURE OF DEPOSIT—GRANULARITY, ETC.

Negatives inclining to thinness make, as a rule, the best enlargements, though, by the exercise of care and skill in exposing and developing, good results may be obtained from almost any type of negative. When the negatives are taken specially with a view to their subsequent enlargement, exposure and development should be so adjusted as that just the correct amount of density is obtained. On this point it should be noted that if daylight is to be employed as the illuminant in the enlarging process the negatives may, with advantage, be a little more vigorous than would be advisable were artificial light to be used. In order to obtain the best results, therefore, with very dense negatives, it is almost imperative to enlarge by daylight, artificial light, by reason of its low intensity, failing to penetrate and properly register in the enlargement the strong deposit in the high lights.

Sharpness is an indispensable attribute of a negative intended for enlargement, therefore good lenses should be employed in its production,* and

* *Vide* chapter upon lenses for enlarging.

care exercised in focussing, for any lack of definition in the small original will be greatly increased in the enlargement. To secure sharpness, medium or small stops should be employed, unless the negatives are of quite small dimensions, such as quarter-plate, to produce which short-focussed lenses are usually employed; these, if of good quality, have so much depth as not to require very much stopping down. The exposure is also a very important factor in determining the character of the negative. It is well known that under-exposure and consequent forced development tend to the production of a more or less granular image—a condition of things we particularly wish to avoid. It is necessary, moreover, that the negative should be "full of detail," even in the shadows, and to secure these qualities a generous exposure must be allowed.

In regard to development, which is really the crux of the whole matter, a great deal might be written, but lack of space prevents me from doing more than indicate general principles. The "generous exposure" advocated will probably require the proportion of accelerator in the developer to be reduced to below the normal—indeed, the mixed developer may be further diluted with water to the extent of half its bulk with advantage. Care must be taken not to carry development too far, for if this be done the high-lights will become too opaque, and the detail in them more or less obliterated. It is to guard against this that I recommend

a full exposure and the use of a weak developer. While our aim is to develop out all possible shadow detail, we at the same time wish to preserve the full scale of gradation, and produce a soft and harmonious result. The reader will probably continue to use the developer to which he is accustomed, and he will be wise in so doing, but it is necessary to point out that the *colour* of the developed image will have to be taken into consideration in deciding when to arrest development. For instance, plain pyro gives a yellowish deposit, amidol a bluish black; the former being far more non-actinic than the latter, development would have to be carried much further in the one case than the other, and *visually* the pyro-developed negative would appear much thinner and weaker than that developed with amidol. Correct density should, if possible, be obtained by development, and recourse to intensification avoided. When this is impossible the mercurial methods should be eschewed, and the uranium intensifier employed. The latter gives a softer and more harmonious result than is obtainable with mercury, and has less tendency to unduly block the high-lights; moreover, if the result prove unsatisfactory, the negative may be brought back to its original condition by immersion in a weak alkaline solution.

I have already pointed out that an image as free from granularity as possible should be aimed at, and the character of the emulsion on the plate

used will to a very considerable extent determine this matter for us. The selection of a suitable plate, therefore, becomes a very important matter. One of moderate rapidity is indicated, for the reason that granularity increases, *pari passu*, with the speed of the emulsion. It would, of course, be invidious to particularise, but different makes of plates will be found to yield negatives of very different character as regards the condition of the deposit forming the image. To sum up, good gradation, sharpness, and delicacy are the special features to be aimed at in the production of negatives intended for enlargement, and these will be most readily secured upon a plate which with suitable manipulation gives a fine deposit and a soft yet vigorous image.

CHAPTER IX.

PROCEDURE — EXCLUSION OF WHITE LIGHT — POSITION OF NEGATIVE—FOCUSSING, HINTS UPON —MANIPULATING BROMIDE PAPER—CALCULATING EXPOSURE—VIGNETTING—PRINTING IN SKIES—WASHING—FIXING—SECOND WASHING—ALUMING —DRYING, ETC.

Before proceeding to make an enlargement, all actinic light, whether emanating from the apparatus itself or from chinks and crannies round the window or door of the room, must be carefully blocked out; if this be not attended to, foggy, flat-looking prints may be anticipated. The enlarging camera, or lantern, being in position, the negative is inserted in the carrier upside down, and film side towards the enlarging lens; if the glass or uncoated side were to be placed towards the lens the image would be reversed as regards right and left. The distance at which the lens should be from the negative will be determined by the size of the enlargement, and a reference to the table of enlargement will show at a glance the approximate amount of separation for a given degree of amplification.

The next matter is an extremely important one, the focussing of the enlarged image. It is always a difficult operation to focus sharply on an opaque surface, though comparatively easy to do so on one composed of a sheet of finely-ground glass: in the latter case the use of an ordinary "focussing glass" will be found of great assistance. It is hardly necessary to say that if the original negative be wanting in sharpness no amount of care in focussing the enlargement, or stopping down the lens, will make the enlargement sharp. It is very seldom that a negative is uniformly or equally sharp all over; therefore, before proceeding to focus, its sharpest portion should be noted, and that part selected for obtaining the sharpest focus on the screen. The stop intended to be used should then be inserted. With a good lens a stop smaller than f/16 will rarely be necessary, unless critically fine definition is desired.

All actinic light being excluded, the packet of bromide paper is opened, and a sheet of paper withdrawn from the envelope. In so doing care must be taken to avoid touching the coated surface of the paper with the fingers, or markings and stains will probably result, for, however clean and free from mechanical impurity the hands may be, the insensible perspiration, which is always present, contains various fatty acids, which set up a chemical reaction with the developer when it is applied to the paper. Any doubt as to which is the

sensitised side of the paper may be removed by remembering that the coated side always curls inward.

In regard to calculating the necessary exposure, very little useful information can be given on account of the variable nature of the factors which determine it, chief among these being the nature of the illuminant, the density of the negative, the degree of enlargement, and the rapidity of the sensitive surface employed. The best plan to adopt is to cut up one of the twelve pieces of bromide paper into twelve strips of equal width, and to make it a rule to give a graduated exposure upon one of these before exposing the full-sized sheet. The behaviour of the strip upon development will indicate approximately the proper duration of exposure.

Vignette is the term applied to photographs, or enlargements, which, instead of being printed right up to the edges of the paper, are shaded gradually off to a white margin. Although exception is frequently taken to this style of photograph upon artistic grounds, there is no doubt that with certain subjects the treatment is very effective. Particularly is this the case in some portrait studies in which the pose is faulty, for by vignetting just the head and shoulders an excellent enlargement may often be made. Sometimes, too, a landscape with a beautiful middle distance, and distance, is marred by an uninteresting, or even ugly, foreground; in

this case also judicious vignetting may effect a great improvement. It is not, however, a power to be employed without discrimination, and the reader should exercise all the taste and judgment at his command in deciding when to employ it.

The operation is simplicity itself. A large piece of millboard has an oval aperture cut out of its centre, the edges of which have been carefully serrated with a pair of sharp scissors. The cap having been removed from the lens, the cardboard vignetter is interposed between the lens and the screen; its exact position being determined by the size of the enlargement and the amount of picture desired. The vignetting effect is, of course, produced by the opaque cardboard cutting off all the margins of the picture. A little practice is required in order to get the best effects; the card must not be held motionless, but should be moved with a gentle rotary motion during the exposure, the eye being kept on the enlarged image to see the effect produced. In this way either a plain white margin or a very slightly-defined marginal image may be easily produced. It will be obvious that this system of vignetting cannot be adopted when the enlarging camera is used, which is, perhaps, the chief objection to that mode of working.

Printing in Skies. A small photograph with a blank white expanse of paper which should be occupied by suitable clouds is objectionable enough upon artistic grounds, but, when enlarged three or

four diameters, the fault is still more glaring. Unfortunately, it is not an easy thing to the average amateur to double print by contact methods, and the majority altogether shirk the attempt to introduce skies into their enlargements. It is not, however, in many cases, at all a difficult matter if a little care be exercised. Of course, instantaneously-exposed negatives frequently have natural clouds (indeed, if the method of giving a graduated exposure with a shutter of the curtain type be adopted, natural clouds can always be obtained, when present, in the landscape negative), and in such a case there is no necessity for double printing. But it sometimes happens, owing to defective development, that the sky portion of the negative is too dense to give, with a correct exposure for the landscape, a good rendering of the clouds. To remedy this a cardboard shield should be roughly cut to the outline of the horizon, and after the paper has received a correct exposure for the landscape, the shield is interposed, the landscape masked, and the necessary additional exposure for the sky given.

When it is necessary to print in a sky from a separate cloud negative the following procedure is adopted. The landscape negative is first placed in position, and the necessary exposure given. By the way, the sky portion of this negative must be sufficiently dense to prevent any light-action being evident on development. Whilst the image is still

cast upon the sensitive surface mark the outline of the horizon with a pencil as a guide for the next step in the process. Now make a cardboard mask or shield in a similar way as before, cap the lens, insert the cloud negative in the place of the landscape, remove the cap, keeping the shield in proper position, and give the necessary exposure. Do not over-expose; unless the effect of a thunderstorm is desired, clouds should be rendered in as light and airy a manner as possible. Here, as in vignetting, the shield must not be held motionless, but must be kept moving gently down to but not below the horizon. It is a good plan when work of this kind is attempted to procure a lens cap with a piece of yellow glass in lieu of the ordinary opaque leather. The adjustment of the shield can in this way be more easily arranged, as the image, although it can be clearly seen, will not, until the cap is removed, be impressed upon the sensitive surface.

After exposure the paper is removed from the dark slide, or easel, and transferred to a dish of clean water, in which it should be allowed to remain until thoroughly saturated with moisture; about a minute's immersion should be sufficient. This must be done in such a way that bubbles are not allowed to form, and if the following plan be adopted they will be avoided: Place the paper in the bottom of the dish, face upwards, fill the dish from the tap or jug, allow to soak for half a minute, then lift the paper by the corners and turn it,

emulsion side down, allowing it another half a minute's soaking, again turn it, and finally pour off the water; it will then be ready for development (see Chapter X.)

First Washing. This takes place after pouring off the acid clearing bath when one has been employed. It is necessary to remove all traces of acid, for if any be left in the print when it goes into the fixing bath a general reduction of the image will take place, or at any rate an eating away of the half-tones. In dealing with single prints it is best to put them in a clean dish and let the water from a tap run over them for a couple of minutes, holding the dish at an angle, so that the water runs off freely; this is far more effectual than protracted soaking.

Fixing. The fixing bath should always be freshly made. The manner in which fixing is performed will in a large measure determine the stability of the enlargement. It is not desirable to use too strong a bath, or the more delicate tones may be affected. The following is a good average strength:

Sodium hyposulphite	...	4	ounces.
Water . .	...	20	,,

When ferrous-oxalate development is employed, no addition of any kind should be made, though the acid fixing bath of Lainer may be used for prints developed by amidol, eikonogen, and hydro-

quinone. I prefer and recommend, however, the plain solution just given. The prints should be thoroughly immersed in the fixing bath, and pushed beneath the surface of the solution, care being taken to avoid bubbles, which would result in the formation of spots. White light should not be admitted until the prints are fixed, and plenty of time should be allowed for fixation; the unaltered silver bromide will disappear in a few minutes, but the prints must be allowed at least ten minutes in the bath. A still better plan is to use two baths, giving seven minutes in each.

Second Washing. This is necessary to remove the hypo from the prints. A short washing in running water is more effectual than prolonged soaking, and where only a few prints are to be washed the method already described should be followed. There are some very efficient washing machines in the market, but these, for large sizes, are costly. In houses where a bathroom is available, the prints may be first washed in a dish under the tap, and then allowed to soak for a couple of hours in the bath, changing the water at intervals of half an hour.

Alum Bath. This consists of a saturated solution of ordinary alum, in which the prints are immersed for about ten minutes. The aluming or hardening may be done either before or after fixing. In hot weather, when the temperature of the washing water is high, the gelatine film is apt to swell and rise in

the form of blisters and frills, sometimes leaving the paper. The employment of an alum bath before fixing will generally remedy this evil, but care must be taken to first remove all traces of acid, or the half-tones of the picture will suffer. The use of an alum bath, after fixing and washing, will remove the last traces of hypo from the enlargement, and add to its permanence, but care must be taken to thoroughly wash out the alum.

Drying. The enlargements must be allowed to dry spontaneously; heat must on no account be applied. A line or cord should be stretched across the dark room, and the enlargements hung from it by means of wooden American clips. The only objection to this plan is that the prints contract and roll up when dry. This may be overcome by pinning them down whilst wet by the four corners to a blotting board. No attempt to blot off superfluous moisture must be made, as the fluff from the blotter would adhere to the gelatine and spoil the prints.

SECTION III.

Enlarging Processes.

CHAPTER X.

Enlarging on Gelatino-bromide Paper—General Considerations—Rough *v* Smooth Surfaces—Makers' Instructions—Dark-room Illumination — Choice of Developer: Amidol, Eikonogen, Quinol, Ferrous Oxalate—Solutions Required—Exposure—Details of Development, etc.

The production of direct enlargements upon gelatino-bromide paper is the process *par excellence* for the beginner, and there is no doubt that in point of convenience it possesses advantages not found in any other, chief among them being its great rapidity, which enables it to be used effectively when only a weak source of light is obtainable. With such an advantage, it is not surprising that it should have rapidly ousted all older methods from public favour, and become the favourite process. It is, moreover, an extremely easy one to work, and when properly and skilfully

manipulated is capable of producing results which leave little to be desired from an artistic point of view. At the same time, it must be confessed that, with injudicious treatment and want of care, no process lends itself more readily to the production of bad work.

In point of permanence, it compares favourably with other processes, provided always that certain essential conditions have been complied with. It is, of course, an easy matter to make bromide enlargements of the most fugitive character, but such results may always be traced to unskilful or faulty manipulation, and are not due to any inherent shortcoming of the process itself. I do not, on this point, however, wish to be misunderstood. Permanence, as applied to photographic processes—and as photographers understand the meaning of the word—is a relative term, and I do not wish it to be thought that I should rank a bromide enlargement as being equal in permanence to either a platinum or a carbon print. But among the silver processes which still enjoy so much popularity, the gelatino-bromide process has stronger claims than any to be regarded as permanent.

Much of the so-called fading of bromide enlargements is not, strictly speaking, fading at all, but the direct result of an unscientific or careless use of the ferrous-oxalate developer. As, however, ferrous-oxalate development has been, to a large

extent, superseded by other developers not open to this defect, this particular form of deterioration is not so frequently met with nowadays as formerly. The yellowing and apparent fading of the image when due to this cause was the result of allowing traces of iron salts to remain in the pores of the paper through insufficient washing in an acid bath, which, though invisible at the time, ultimately led to a yellowing of the whites and general degradation of image. Modern developers have, as I have said, removed this source of danger, but, with due care in working, the iron developer which produces an image of well nigh unsurpassable delicacy, may be worked in safety. Briefly, the two main points to which attention must be directed in order to secure permanent and reliable results are, first, copious washing at each stage of the process, in running water, for no other method is completely efficacious; and second, thorough fixation in a freshly-mixed neutral fixing bath.

The range of colour obtainable is a fairly wide one, ranging from cold to warm black, by simply modifying the exposure and the mode of development, while, if subsequent toning is adopted, almost any shade of brown can be obtained. Correct exposure and normal development, when enlarging from suitable negatives, should give results leaving little to be desired from any point of view,

and which might readily when framed and glazed be mistaken for platinotypes. Probably higher praise than this could not be at present accorded to any process, but it must be distinctly understood that only the painstaking and careful worker is likely to attain to results that will, from an artistic point of view, so favourably compare with that which is generally acknowledged to be one of the finest of known processes.

There are a great many different makes of bromide paper now in the market, and in point of excellence I think they are all fairly equal, though their relative rapidities vary considerably. For this reason, if for no other, I should strongly advise the reader to make up his mind which particular manufacture he elects to choose, and keep to it until a thorough knowledge of the process is obtained. Variation in rapidity, however, is not the only reason for so doing, for each particular make of paper possesses certain characteristics which distinguish it from others, and, as it were, give it an individuality of its own. For instance, one very popular make of paper is very prone, in the hands of a novice, to give hard prints, devoid of half-tone, though the same paper when suitably manipulated is capable of rendering every shade of gradation existing in the negative. Again, with the paper of another manufacturer, many beginners experience the greatest difficulty in obtaining vigour, though,

similarly, the fault lies with the operator and not with the material.

The question of roughness of surface is purely a matter of taste, and all manufacturers now coat paper of different degrees of roughness. Generally speaking, the finer-surfaced papers will be found most suitable for small sizes and contact printing, the rough surfaces being best for enlarging upon, particularly if the degree of magnification be very great, in which case very rough surfaces indeed may be employed with advantage Very copious instructions in the use of the paper are issued with each package, and these should be most carefully read, for it is only fair to assume that the maker is at least as well, and probably better, acquainted with the treatment best suited to his own productions as anyone else can be. Let it be understood, therefore, that these hints and suggestions are intended to supplement merely, and not to supplant, the instructions which accompany the paper.

The first point to be attended to is the nature of the light by which we intend to work. When we learn that the most rapid bromide paper is very much less sensitive than the slowest bromide plate it becomes apparent that we may use not only a brighter light but more of it. For bromide printing ruby light of any kind is a mistake; a good yellow light and plenty of it is far more suitable. Yellow fabric, such as is obtainable at any photographic dealer's, forms the best medium, and one

thickness will be ample. My own dark room lantern is covered with this material, behind which, about twelve inches away, burns an ordinary bat's-wing burner, and with the light so obtained I can see to read a newspaper comfortably. This question of lighting is a more important one than it would at first seem to be, and for this reason, that the progress of the development of the enlargement requires to be most closely watched, its removal from the developer at the proper moment without hesitation being a matter of vital importance, and one upon which the excellence, or otherwise, of the final result will largely depend.

In regard to the choice of a developer, a great deal of difference of opinion at present seems to exist Development with amidol and with ferrous-oxalate will be dealt with in detail in this chapter, but directions and formulæ for the use of other reducing agents will be found in another chapter.

Hydroquinone is warmly advocated by many, and, certainly, if that were all, it possesses a great advantage in point of cleanliness and freedom from any propensity to stain; but I frequently find that the colour of the print leaves much to be desired, and the tendency to clogging of the shadows before the half-tones are properly out is frequently very great. At the same time, if the exposure has been approximately correct, and the negative presents no very severe contrasts, good results may be attained.

Up to the time when the last edition of this treatise went to press I was an advocate of the use of the ferrous-oxalate developer in preference to all others for the development of bromide enlargements, but subsequent experiences with amidol have induced me to modify my opinions somewhat. The image produced by amidol is little, if at all, inferior to that produced by ferrous-oxalate, and in point of cleanliness and ease of manipulation amidol possesses undoubted advantages over its rival. The employment of a series of acid baths, the trouble of preparing and keeping the developer, and, to a very large extent, the danger of stains from chemical contamination, are all difficulties well known to the users of ferrous-oxalate, but which are unknown to those who only employ amidol. I therefore have no hesitation in giving it the premier position in the present edition, though, as many people will probably continue to employ ferrous-oxalate, I shall retain the original directions for its proper use.

Amidol has one drawback, if such it can be called: it will not keep in solution, otherwise it is the simplest of all developers to use, requiring very few other ingredients, and possessing the almost unique power of exerting a direct developable action in itself without the aid of an accelerator.

My own method of using it is to make up a stock solution of pure sulphite of sodium of the following strength:

Sodium sulphite	1 ounce.
Distilled or boiled water	40 ounces.
Potassium bromide ...	10 grains.
Citric acid	15 „

This solution will keep indefinitely, and only requires the addition of the necessary quantity of amidol at the time of using. Amidol is purchased in the form of a grey crystalline powder, and for general purposes should be added to the stock solution in the proportion of four or five grains to the ounce. A convenient method of working, which avoids the necessity of frequently weighing small quantities, is to procure an ordinary bone mustard spoon, which can be filed down until it just holds a given quantity.

Those who prefer to use an even simpler formula are recommended to try the following, introduced by Mr. Wellington:

Sodium sulphite ...	650 grains.
Potassium bromide .	10 „
Citric acid	10 „
Amidol	50 „
Water	20 ounces.

This will not, as a rule, keep in good condition for more than a week. It should be noted that amidol requires less exposure than would be necessary with ferrous-oxalate.

The exposed paper should be soaked in a tray of clean water until it is quite limp, and evenly

wetted before applying the developer. The latter should be poured on one corner with an even sweep so as to avoid development markings or the formation of bubbles. If the exposure has been correct, the image will not be long in making its appearance, but sufficient time must be allowed for the attainment of density. The first formula works rather more slowly than Mr. Wellington's, and a fuller exposure can be given. If exposure and development have been properly adjusted, the colour of the enlargement should be a pure engraving black, equal in all respects to that produced by ferrous-oxalate. If an excess of bromide or of citric acid (which latter is a more powerful restrainer than the former) is added, the colour will be warmer. A short exposure and strong developer will produce black, strong prints, whilst grey tones and softer results can be obtained by increasing the exposure, adding more citric acid, and diluting the developer with water. As I have said, an acid clearing bath is not required, nor is a prolonged washing after development necessary In fact, the prints should not be left to soak in the washing water, as the developing action will continue to slowly proceed, and the resulting enlargements may appear over-developed. A fresh fixing bath should be used for each batch of enlargements, and if this course is adopted they may without danger be transferred direct from the developing dish to the fixing bath.

From the point of view of excellence of result I consider that ferrous-oxalate has strong claims to occupy the second place in the order of merit of the many developers now available for the development of bromide paper. Absolute cleanliness in all manipulations is, however, more imperative with this developer than any other; the slightest contamination with even the merest trace of pyro or hypo, or other chemical, will be fatal to good results. It is, therefore, *absolutely imperative* that the dishes used for developing bromide enlargements with ferrous oxalate be kept for that specific use only, and it would be well also if the same rule were applied to the trays used for washing and fixing. The developing tray should always be cleaned after use and before being put away. I say "cleaned" advisedly, because washing with ordinary tap water, which very often holds various carbonates in solution, will not suffice, as the hard water in the presence of the ferrous oxalate throws down an insoluble precipitate which is extremely difficult to get rid of. The dishes, therefore, should be first rubbed with a cloth dipped in a solution of hydrochloric acid and water, which will remove the deposit, a subsequent rinsing in clean water being, of course, necessary.

The stock developer consists of saturated solutions of potassium oxalate and ferrous sulphate. The former may with advantage be made up in bulk, as it does not appear to in any way deteriorate by

prolonged keeping. To make it, put 2 lbs. of potassium oxalate in a stone jar, and pour over it five pints of boiling water. This should be violently agitated at intervals until the solution cools. The solution must then be tested with litmus paper, and will probably show an alkaline reaction, in which case oxalic acid must be added until litmus paper distinctly reddens. This forms the stock solution No. 1, but it should not be used direct from the jar, a better plan being to filter off a small quantity from time to time as occasion may require. The No. 2 solution of ferrous sulphate is quite as easily prepared, but is more difficult to keep, and as a much smaller quantity, comparatively, is used than of the oxalate, it is not well to make up too much at a time. Ferrous sulphate in clean, bright green crystals, is dissolved to saturation in hot water, the cooled solution being made distinctly acid by the cautious addition of sulphuric acid. This is part of the secret of imparting to it good keeping qualities—the remaining precaution being to keep the stock bottle tightly corked, or stoppered, and full up to the neck. A ten per cent solution of potassium bromide completes the developer. An acid clearing bath to prevent the precipitation of the iron in the pores of the paper will be necessary. Various acids are recommended for this purpose. Personally I prefer acetic acid, and I use it in the proportion of one dram of the acid to a pint and a half of water. The fixing bath

should always be a new one, and should contain about four ounces of the hyposulphite to twenty ounces of water. In this connection it may be well to refer to a charge, namely, that of want of permanency, which is sometimes brought against bromide prints and enlargements. I believe myself that a properly fixed and washed bromide print is likely to be as permanent as one by any other process, and that where fading has occurred it may be more often traced to imperfect fixation than to imperfect washing. Therefore, I would strongly recommend the adoption of two fixing baths, giving the print ten minutes in each. If this plan be adopted, and the prints properly washed, little fear need be entertained on the score of fading.

Correct exposure can only be learnt by practice, and no rule for determining it can be laid down. With artificial light the factors which determine it remain fairly constant, and errors are not so likely to occur, but with daylight, on the other hand, the constant variation in the actinic value of the light which is always occurring renders accurate judgment in this respect a more difficult matter. In either case it is better to make a test exposure on a small strip of paper before exposing the large sheet, as by so doing waste will be avoided. My own method of working differs considerably from that recommended by the makers. I will not venture to assert that it is better, but, in my hands, it is more certain and gives me uniformly good results. I

have, therefore, no hesitation in recommending the novice to adopt it. In the first place, I give what would be a very full exposure, if development were conducted on the lines laid down in the printed instructions accompanying the paper—that is to say, if one minute were the ordinary time of exposure, I should give from one and a half to two minutes, and my developer would be compounded as follows: Supposing I wished to make 6 ozs. of mixed developer, I should take 3 ozs. of the oxalate solution, to which I should add ½ oz. of the iron, and a few drops of a ten per cent. solution of potassium bromide, making up the bulk to 6 ozs. with distilled water; *tap water will not do*, as it would cause a precipitate of oxalate of lime.

It will be seen that the method is simply to give a full exposure and develop with a dilute and well-restrained developer. If the exposure has been suitable the picture will appear slowly, and gradually gain in strength until all detail is out; it must now be closely watched, for if removed from the developer at this stage it would probably be found to be lacking in density. The darkening, however, takes place more rapidly towards the conclusion of development, and only observation and a little practice will enable the reader to determine the proper time for its removal. The picture should be allowed to develop a little darker than it is desired to appear when finished, as there is usually a slight reduction in the fixing bath. It is well to

have the bottle containing the clearing solution convenient to hand, so that the clearing bath may be poured over the enlargement directly development is complete. This at once arrests development, and prevents the formation of any deposit on the paper. After the print has been allowed to remain in the acid bath for a few minutes, it must be most thoroughly washed in several changes of water, for, if the acid be not thoroughly removed, more or less reduction will take place in the fixing bath. I have already alluded to the utility of employing a second fixing bath, and I will not further refer to the matter, beyond expressing the opinion that perfect fixation is as essential to the permanency of a bromide print as prolonged washing.

Enlargements, produced by either of the foregoing methods of working, should be of a fine black colour, and should reproduce every gradation of the small original.

CHAPTER XI.

ALPHA PAPER—RANGE OF COLOUR OBTAINABLE—EXPOSURE NECESSARY—TONES PRODUCED BY DEVELOPMENT.

Since the first edition of this book was published the Ilford Dry Plate Co. have again made this very useful paper sufficiently rapid to permit of its being used for direct enlargements by daylight methods. The fact that any colour from black to red may be obtained gives it an undoubted advantage over bromide paper and for these reasons I intend to devote some attention in the present volume to its manipulation. Any of the developers recommended for bromide paper may be used for the development of Alpha paper, but will require considerable dilution. Ferrous-oxalate or hydroquinone may be relied upon for giving good results; personally I prefer the former. It has always been a matter of surprise to me that this paper has not been more appreciated by photographers generally than it has, for upon no other paper with which I am acquainted can such a wide and varied range of colours be obtained. Moreover, if the colour produced by development is not considered satisfactory it can, by

subsequent toning, be further modified until just the desired effect is obtained. The paper is considerably slower than even the slowest bromide paper, and is therefore more suited to daylight enlarging than to artificial light methods. The exposure necessary will depend, of course, upon local circumstances, though as a rough guide I may say that enlarging by daylight, the camera pointing to the sky, with a rapid rectilinear lens working at f/16, the degree of enlargement four diameters, an exposure of about ten minutes is required. A great deal will, of course, depend upon the negatives, although I think Alpha paper is more amenable to different qualities of negatives than bromide paper when its manipulation is thoroughly understood. Thinnish negatives give, perhaps, the best results, but by modifying exposure and development fine enlargements may be obtained, even from hard negatives.

The tones produced by development will vary in warmth with the duration of exposure, the longer the exposure the warmer the colour, and in order that the reader may fully appreciate the range of tone obtainable in this way, I would strongly recommend him to give a sheet of paper a graduated exposure by gradually uncovering the negative, or drawing out the dark slide an inch or so at a time. Upon developing the enlargement so made it will be found that the portion of the print which received the shortest exposure will be of a brownish

black colour, whilst that which received the longest exposure will be of a bright red. Where several enlargements of the same colour have to be made, care must be taken to give identical exposures, and to use a developer of the same strength in each case, otherwise the results will not be uniform in colour. From a professional point of view, this is perhaps the sole drawback to the use of this paper, but even this difficulty may be entirely overcome by toning the prints subsequently to development.

I give preference to the ferrous-oxalate developer, though it requires greater care in avoiding contamination with other chemicals than does hydroquinone. The stock solutions of oxalate of potash and sulphate of iron recommended for bromide paper may be used as follows:

Potassium oxalate (saturated solution)	4 parts.
Ferrous sulphate (saturated solution)	1 part.
Distilled water	6 parts.

Tap water must on no account be used, or a precipitate will be formed. The exposed paper is soaked in clean water until limp, and the developer flowed on and kept in gentle motion. The image will be rather slow in making its appearance, and development must be continued until the print is

of the required vigour, when, without washing, it is transferred to an acid clearing bath.

It is then well washed, and finally placed in a fixing bath of the same strength as used for bromide enlargements. If, after washing, the colour be unsatisfactory, the print may be toned. When, however, the prints are to be toned with gold, the combined toning and fixing bath can be used with advantage. When gold toning is to be resorted to a full exposure should be given, so that a warm colour can be obtained by development, for it will be found that a warm image tones more readily and to a better colour than a cold one. The following is the formula for the toning and fixing bath:

Water	10	ounces.
Sodium hyposulphite ...	2½	„
Sodium acetate	½	ounce.
Ammonium sulphocyanide ...	¼	„
Gold chloride	4	grains.

As the paper is very slow, abundance of yellow light may be used for development, and after the developer has been well washed off the subsequent toning is best performed in weak white light, such, for instance, as that afforded by a candle, as then the progress of toning and the colour obtained can be more easily estimated. The range of tone obtainable in this way is very great, running through various shades of brown to purple, finally reaching black, and, with very protracted immersion, even

blue. By this treatment it is possible to obtain results which approximate very closely to albumer prints both in colour and appearance. It is, of course, unnecessary to add that when toning is complete the enlargements will require washing in the ordinary way, their after treatment being the same as that accorded to bromides.

If the hydroquinone developer is preferred the formula given on page 113 should be used, and the solutions mixed in the following proportions:

Hydroquinone solution (A)	...	1 part.
Alkaline solution (B) ...	...	1 „
Distilled water	... ...	5 parts.

This is more energetic than the ferrous oxalate, and care must be taken not to over-develop. Development, moreover, must be stopped before the print reaches the full depth required, as it will continue to gain in strength in the washing water. With hydroquinone the acid bath between development and fixation is not necessary.

CHAPTER XII.

Defects, Failures, and Remedies.

Defects due to Errors in Exposure. Hardness and excessive contrast are frequently the result of under-exposure. They may also be due to the use of a negative exhibiting similar qualities, in which case a very full exposure should be given, followed by the application of a weak developer. The use of the hydroquinone developer also tends to the production of undue contrast. The high-lights of the negative have not been properly registered upon the sensitive surface of the paper, and there is a consequent absence of detail and half-tone. If upon the application of a normal developer the image is very slow in making its appearance, under-exposure is to be feared. An enlargement produced under such conditions is worthless, and it is better to make a fresh exposure than attempt to remedy the evil by doctoring the print.

Flatness and want of contrast. These defects are the result of over-exposure, or, sometimes, of the employment of too strong a developer. If checked at an early stage by pouring off the developer, washing in water, and then re-applying the developer, considerably diluted and restrained, the

enlargement may sometimes be saved, and a pleasing result obtained.

Yellow Prints. Generally met with when the iron developer has been employed, and due to insufficient clearing. It will also occur with alkaline development if the fixing bath is allowed to become discoloured by the developer. Care must be taken, especially when using amidol, not to allow the fixing bath to become over-charged and highly discoloured with the oxidised developer, or in addition to discoloration a reducing action may be set up. The same fixing solution should never be employed for enlargements developed with different developers. When the defect is due to a retention of iron in the paper it is not easy to remedy, but in either case immersion in the following clearing bath *freshly* mixed may improve matters:

Alum (saturated solution)	...	20 ounces.
Pure hydrochloric acid	...	¼ ounce.

As this solution has a slight reducing action its effect upon the prints must be carefully watched. Thorough washing must follow. Sometimes when using the ferrous-oxalate developer a yellow powdery deposit occurs all over the surface of the enlargement; it is caused by adding an excess of iron, or by diluting the developer with tap water. It may be removed by pouring off the developer and carefully wiping the surface of the enlargement with a tuft of cotton wool. The application

of two or three acid clearing baths will complete the removal of the deposit.

Fogged images are due to various causes. The paper may have been affected by exposure to an unsafe light prior to or during development. It may also be due to the use of defective emulsion, though with papers of English manufacture this would be of extremely rare occurrence. Too strong a developer will also cause fog; this is indicated by the rushing up of the image, and the remedy is obvious. A contaminated fixing bath is a fruitful source of fog; a bath used for fixing iron-developed prints should never be used for those developed with hydroquinone, or *vice versâ*.

Green prints are caused by under-exposure or the use of too large a proportion of bromide in the ferrous-oxalate developer. The prints may be greatly improved by toning, either with gold, in which case a good black colour will result, or by one of the other methods described in the chapter on Toning.

White spots are generally the result of small bubbles forming on the surface of the paper when the developer is applied; care should be taken to remove them as they occur with the tip of a clean finger, or, preferably, a camel-hair brush kept for the purpose. If not observed until after development they may be touched out with pencil or pigment (see Chapter XIV.)

Stains are caused by want of cleanliness—chemical contamination brought about by dirty measures or dishes. The greatest possible care is required when using ferrous oxalate. The dishes employed must not be used for other developers, the slightest trace of hypo, or pyro, would immediately result in the production of indelible black stains. The fixing bath should not be touched until all the prints have been developed and cleared. The remedy for stains is cleanliness. When they occur it is generally futile to attempt their removal. A weak solution of potassium cyanide is sometimes recommended, but the remedy is often worse than the disease, for when used sufficiently strong to effect its object it generally dissolves out the image at the same time. It is, moreover, a very dangerous substance to handle, and not one that can be recommended to the inexperienced.

Development marks are caused by want of care in applying the developer. Instead of flowing on the solution in an even sweep, the paper is only partially covered. The exposed paper should always be soaked in clean water until thoroughly wet and limp. This ensures the easy flow of the developer over its surface.

CHAPTER XIII.

TONING—RANGE OF COLOUR OBTAINABLE—URANIUM TONING—FRY'S METHOD—GOLD TONING METHODS—HYPO AND ALUM—COPPER TONING.

The colour of a bromide enlargement which has received a normal exposure and development, or of one produced by the method described in Chapter X., will be a fine engraving black. But at the present time there is a rage for warm tones, and the majority of the photographs upon the walls of our exhibitions are of a decidedly ruddy hue. The reader's taste or artistic perception must be his guide in deciding whether a particular subject will be most pictorially rendered by being produced in a warm or in a cold colour.

There are several methods by which the colour of the image produced by development may be modified or toned. The first which I shall describe is obtained by submitting the enlargement to the action of the uranium intensifier. The application of this solution to the toning of bromide prints was first publicly brought to the attention of photographers by Mr. Weir Brown, though I had toned bromide enlargements in a similar manner as early as 1885.

Unfortunately, the uranium toning method has not withstood the test of time, and enlargements so treated have been found to more or less rapidly deteriorate and fade. I cannot, therefore, recommend the process, but as it is so generally used I include a description of it in order to make this book complete as a work of reference.

The action of the atmosphere will quickly produce a change in the appearance of a uranium-toned print. It more or less quickly assumes an iridescent appearance, and ultimately begins to discolour and fade. If the prints are protected from atmospheric influences, by very careful framing and glazing the action is greatly retarded, but in course of time it is sure to make its appearance. Enlargements toned with uranium should therefore be mounted and framed without delay, and the glass and backboard should be pasted in with slips of waterproof paper to make the frame as air-tight as possible and exclude dust.

The colours producible range from warm black, brown, sepia, to a kind of Bartolozzi red, according to the degree to which the toning action is allowed to proceed. Mr. H. Fry, who has given the matter considerable attention, recommends the following formulæ:

(1.)

Potassium ferricyanide	...	20	grains.
Acetic acid	...	½	ounce.
Distilled water ...	...	10	ounces.

(2.)

Uranium nitrate	... ...	20 grains.
Acetic acid ...	... ...	½ ounce.
Distilled water	... ...	10 ounces.

Equal portions of these solutions are mixed just before being required for use. When the ferrous-oxalate developer has been used, the greatest care must be taken to remove all traces of iron from the fibres of the paper—a very difficult matter, only to be successfully accomplished by subjecting the print after development to a series of at least three strong acid clearing baths. If this is neglected blue stains will inevitably make their appearance when the uranium intensifier is applied, and the enlargement will be spoilt beyond redemption. This objection does not apply to the other developers. Prints which incline to flatness, and which are not over-dense in the shadows, as a rule give the best results when toned, therefore care should be taken not to over-develop, for the toning is really an intensifying process, and adds materially to the strength of the image. The enlargement may be toned directly it leaves the final washing water after fixation, or at any time subsequently, though in the latter case it should be soaked in clean water until limp before applying the solution. The wet print is laid face up in a clean dish, and the intensifier poured over in an even sweep. The dish must be kept in motion as in

development, or the toning action will proceed unequally. To avoid unequal toning and to economise the solutions, Mr. Fry recommends the following procedure: He lays the print face upward on a clean sheet of glass. A large handful of cotton-wool, after having been rinsed in water and squeezed nearly dry, is dipped in some of the toning solution, and applied by mopping and sponging boldly to the surface of the enlargement, plenty of solution being used. Whichever method be adopted, when the desired tone is reached, the print must be washed in several changes of water until the yellow tinge, which at this stage will pervade the whites, disappears. The paper must not be left too long in the washing water without attention, or the entire colour may be discharged. In this way the depth of tone can be regulated to a nicety in the event of the enlargement having been in the first place over-toned. By adding a few drops of alkali, ammonia, or soda, to the washing water, the colour will be at once discharged.

In previous editions of this work I described a method of toning bromide enlargements with the Platinotype Company's one-solution intensifier, which yielded delightful shades of brown, and gave very permanent results. Since then, however, the company have altered the composition of their intensifier, and the results, as regards colour, are not satisfactory. I therefore do not feel justified in

including a description of the method in the new edition.

A very simple method of toning—and one, moreover, capable of producing exceedingly artistic results, and which is said on high authority to be permanent—was recently introduced by the Eastman Kodak Co. It is particularly suited to rough, coarse textured papers, such, for example, as the "Royal" bromide paper issued by the same firm, though any kind or make of bromide paper can be similarly treated.

The following is the formula for the toning bath:

Sodium hyposulphite			...	10 ounces.
Alum	...	...	...	1 ounce.
Boiling water		...	...	70 ounces.

The hypo should be dissolved in the boiling water first, and the alum should then be slowly dropped in with constant stirring. As this is a smelly operation, and sulphurous acid will be evolved, it is advisable to make up the bath in an outhouse, or in the open. The solution will be milky white in appearance, and will throw down a precipitate on cooling. This must not be filtered out, but the solution should be well shaken up just before using. It is in practice necessary to raise the temperature of the bath to about 120° F., as the toning action is very slow when the solution is cold. Sufficient solution should be poured into an enamelled

dish placed over a gas stove; the temperature should be taken with a thermometer before immersing the prints, as if it be too high the gelatine will frill, blister, and melt.

The best results are obtained from fully-exposed enlargements which have been very slightly over-developed, the effect of the toning being to slightly reduce the original contrast. The prints may be toned as soon as they are fixed, or after being washed and dried. In either case they should have been previously soaked in an alum bath, or cold toning bath, to harden the gelatine, as the warm toning bath will at first have a softening effect, though when the toned prints are dried they become tanned almost like leather. When the alum bath is used after fixing, the enlargements need not be thoroughly washed either after fixing or before toning, but the washing after the latter operation must be thorough and complete, and conducted in a stream of running water. The alum bath may be made as follows:

Alum	...	...	...	2 ounces.
Water	...	...	...	70 „

The toning bath may be used over and over again —indeed, its action improves with use. A new bath has a slightly reducing action. This, however, is not noticeable after a few prints have been toned. Plenty of solution should be used, and several prints may be toned together. The opera-

tion, at a temperature of about 120°, takes from twenty minutes to half an hour.

The most recent method of changing the colour of an enlargement from the cold hue produced by simple development to a warmer tone is that introduced by Mr. Ferguson, to whom is due the credit of having first placed at the disposal of photographers a practical method of toning with copper. Sufficient time has not elapsed since the publication of his process to enable one to form a reliable opinion as to the permanence of the colours obtained by it, but Mr. Ferguson has stated that, so far as his own experiments have enabled him to form an opinion, the results are stable.

The three following solutions must be prepared:

No. 1.

Neutral potassium citrate ...	1 ounce.
Distilled water	10 ounces.

No. 2.

Copper sulphate	1 ounce.
Distilled water	10 ounces.

No. 3.

Potassium ferricyanide ...	1 ounce.
Distilled water	10 ounces

For use take one part of No. 1, seven minims of No. 2, and sixty minims of No. 3, always being careful to mix in the order named, and to strictly adhere to the proportion given; then add an equal bulk of water. Toning is best carried out in

a tray, and sufficient solution should be mixed to well cover the enlargement.

The colours obtainable are varied, ranging from a warm black, brown black, purple brown, sepia, to various shades of red. The toning action is rapid. In about half-a-minute the colour of the enlargement will begin to change; one minute generally suffices to produce a pleasing shade of brown, whilst in from two to three minutes we get very reddish hues. The action of the bath will be more under control if the prints are allowed to dry previous to toning. It is unnecessary to add that they must have been previously thoroughly fixed and washed. The toning action should not be allowed to proceed too far, or an unpleasant "plummy" colour may be produced. The enlargements should be developed to normal strength, as this treatment does not appear to materially increase the original density. After toning, a thorough washing, preferably in running water, completes the necessary operations.

Bromide enlargements may also be toned with gold. This method is not often adopted, but is useful when rusty browns or blacks have been accidentally produced by development. The prints should be toned before fixation, and after the removal by washing of the last trace of developer. The toning bath must have a decidedly alkaline reaction or the prints will refuse to tone, and if the prints have been treated to an acid clearing bath every

trace of acid must be removed before attempting to tone. Almost any gold toning formula may be employed, but that ordinarily recommended for printing-out paper will be found suitable.

Ammonium sulphocyanide			60 grains.
Gold chloride	...	...	3 „
Water, distilled	...	...	6 ounces.

The bath is strong in gold, and will tone quickly. The enlargement should be removed when a good black colour is obtained, for if the action be allowed to proceed too far an unpleasant blue colour will be produced.

CHAPTER XIV.

MOUNTING AND FINISHING—SELECTION OF MOUNTS—MOUNTANTS, HOW TO PREPARE—MOUNTING—REMOVING IMPERFECTIONS—SPOTTING, ETC.

Enlargements on bromide paper are usually mounted dry, and any working up or spotting deemed necessary should be done after mounting. In regard to the selection of a mount little need be said; there is no reason why an enlargement should be treated differently in this respect from a direct print, therefore the matter is one that must be left to the good taste of the reader. Plate-sunk mounts of good quality suit most subjects, but the paste-down central tint should *always be of the same colour as the print* (this point is often overlooked)—for example, cream or buff or light brown for brown and sepia-coloured enlargements and pale grey for black ones. Cut-out mounts, with plain, not gilt, bevels, are often effective, but require judgment and taste to secure harmonious results; brown paper of different shades is often extremely effective. Some pictures look best without a mount and when framed up close; a broad and bold moulding is generally required in such cases. Enlargements

showing strong contrasts of light and shadow are often improved by this treatment.

Mountants. From mounts to mountants is but a step, but nevertheless an important one. Starch paste is the best and safest to employ, and will stick well if good starch is used, and if it is properly made. I always use "Glenfield," and prepare it in the following way: To a tablespoonful of dry starch add just sufficient cold water to make it of the consistency of thick cream, taking care to stir with a spoon until all lumps disappear. Now pour boiling water upon it slowly, continuing the stirring, cease adding water directly the paste thickens and becomes clear. It should not be used until cold, and the thick skin on the top should be removed before use. Sometimes a gelatine mountant is employed; it is not, however, so easy to work with as the foregoing. It may be made in the following manner: Soak in a gallipot of cold water one ounce of Nelson's gelatine until soft. When thoroughly swollen pour off a portion of the water, leaving about ten ounces, and heat until all the gelatine dissolves; now add, with constant stirring, ordinary methylated spirit until the cloudiness which first forms disappears. When the mixture cools it will set in a firm jelly; it will require to be placed on the hob to melt it just before use. As frequent reheating destroys its adhesiveness, it is better to bottle off in small bottles or pots, so as to avoid the necessity of melting the entire bulk.

Mounting. Spread a sheet of clean newspaper upon the table, upon which, face down, place the enlargement, which should have been previously trimmed, and apply the mountant with a stiff hog-hair brush, such as painters use, costing about four-pence. The paste should be spread evenly over the entire surface; the dampness of the paste will cause the enlargement to lie flat. After the lapse of a minute or so, go over the print a second time, for most of the starch first applied will be absorbed into the fibres of the paper. The print, before pasting, should be laid on the centre of the mount, and the four corners lightly marked with a pencil. The pasted print is then deftly lifted by two opposite corners, and, taking the dots as guides, carefully laid on the centre of the mount. An india-rubber roller squeegee is then carefully applied, taking care to work from the centre of the print; in this way perfect contact is ensured, and all air bubbles excluded. A clean, soft sponge should be at hand with which to remove any superfluous starch which the pressure of the squeegee may cause to exude.

Removing Imperfections. I strongly deprecate the unrestrained application of brush or pencil to an enlargement. To such a degree, in some cases, is retouching carried, that one is tempted to enquire, "Is this a painting or a photograph?" It is, however, legitimate, and desirable, to remove or rectify such defects as spots, or specks, or

scratches, the result of defective technique or careless manipulation. For this purpose what is known as a bromide retouching pencil will be found very useful for all black enlargements. Light coloured spots or specks can be easily touched out with this, though it may be found necessary, in order that the pencil may "bite," to first lightly rub the part of the print to be worked up with the tip of a finger dipped in finely-powdered pumice. Black spots can be erased with a sharp penknife, but it must be applied with a very light touch. For spotting toned prints on rough surface paper, crayons of different shades of colour can be employed, or water colours may be used. The use of the latter, however, requires more skill, for the gelatine surface will be found very repellent. Mixing a little prepared oxgall with the colour will render its application easier. Enlargements to be so treated should have been previously passed through an alum bath *(q.v.)* The colour must be carefully matched before it is applied to the print, as it cannot be afterwards removed.

CHAPTER XV.

OTHER DEVELOPERS: EIKONOGEN—EIKONOGEN WITH HYDROQUINONE—METOL—HYDROQUINONE —ORTOL, ETC.

Although new reducing agents are constantly being introduced to the attention of photographers, the merits of which are highly extolled in interested quarters, I have no hesitation in saying that in amidol, or ferrous oxalate, the worker has a developer with which he can produce results of the very highest class, and unless it be for purely experimental purposes he has no practical occasion to concern himself with other aspirants to photographic favour. It may, however, be pointed out that when subsequent toning with uranium is to be resorted to, the ferrous oxalate developer should be avoided on account of the difficulty of freeing the print from the last traces of iron, the presence of which would cause blue stains.

Eikonogen is an excellent developer for bromide paper, and produces results which, so far as tone and gradation are concerned, leave little to be desired. For some reason, however, possibly on account of the fact that it is a somewhat troublesome

substance to dissolve, it has never attained to much popularity. It is clean in working, gives, with normal exposures, very pure grey blacks and soft halftones, whilst with more generous exposures, and the addition of bromide, a very pleasant brownish-black can be obtained. I have obained excellent results with the following formula:

No. 1.

Eikonogen	¼	ounce.
Sodium sulphite	¾	„
Distilled water	20	ounces.

No. 2.

Sodium carbonate (pure) ...	2	ounces.
Distilled water	20	„

For use take three parts No. 1 and one part No. 2.

Eikonogen keeps well in solution, and does not stain the hands or paper. It is sometimes urged in favour of this and other developers that several enlargements may be developed in succession with the same solution, but this is a course which, in my opinion, should never be followed by the careful worker who seeks to obtain uniform results of high quality.

Hydroquinone may be used in combination with eikonogen, but it does not appear to the writer, at any rate for the particular purpose in question (the development of enlargements), that any gain results. As, however, some may desire to make the experiment, I append a formula:

Solution 1.

Eikonogen	... 50	grains.
Hydroquinone ...	... 100	„
Sodium sulphite ...	... 480	„
Citric acid	... 15	„
Distilled water ...	... 20	ounces

Solution 2.

Potassium bromide ...	... 10	grains.
Sodium carbonate ...	... 100	„
Distilled water ...	... 20	„

For use take equal parts of each, and dilute with an equal bulk of water.

Metol is a great favourite with many workers, used either alone or in conjunction with hydroquinone. Its chief drawback is that it produces troublesome affections of the skin with some individuals. It keeps well, is clean working, and gives a very good colour, though in this respect it is not so reliable as amidol or eikonogen. It keeps well as a single solution in a concentrated form. The following is a reliable formula:

Metol	... 100	grains.
Sodium sulphite ...	... 2	ounces.
Potassium bromide ...	... 25	grains.
Potassium carbonate	... 70	„
Water	... 20	ounces.

For use add to each part of the developer three to four parts of water.

Hydroquinone. Those who are accustomed to this developer for negative work will probably be pleased with the results obtainable with it on bromide paper. It keeps well in solution in conjunction with sodium sulphite and citric acid. It requires the addition of an accelerator, sodium carbonate being the best for bromide work. It does not readily stain, although under-exposure and the use of an excess of accelerator will sometimes cause a yellowing of the whites. Temperature has a very marked effect upon its energy, and if it fall below 60° F. development is extremely slow, and proceeds with difficulty. This fact should not be overlooked in cold weather, when the solutions should be warmed to about 65° F. The following is a standard formula:

	A.	
Hydroquinone	...	... 160 grains.
Sodium sulphite	...	... 1 ounce.
Citric acid ...	...	... 50 grains.
Potassium bromide	...	... 50 „
Distilled water	...	... 20 ounces.
	B.	
Sodium carbonate	...	... 1 ounce.
Distilled water	...	... 20 ounces.

For use take equal parts of each, and add an equal bulk of water. Correct exposure gives good black tones; by increasing the exposure, and further restraining or diluting the developer, warm

blacks and browns can be obtained. When using hydroquinone the progress of development must be carefully watched, and the solution poured off before the full density required is obtained, because the print will continue to darken while in the washing water, and until it reaches the fixing bath. Prolonged washing between development and fixation is not necessary, or indeed desirable, for the above reason. The tendency of hydroquinone is to give contrast, but this may be reduced by diluting the developer and increasing exposure.

Ortol. This is one of the most recently-introduced developers. It is very suitable for bromide work, gives a good black colour with normal exposure, and a warmer black with full exposure and the addition of more restrainer. It does not stain either hands or paper, and appears to keep well in solution.

Solution 1.

Ortol	70 grains.
Potassium metabisulphite ...	40 ,,
Water	15 ounces.

Solution 2.

Sodium carbonate	240 grains.
Sodium sulphite	600 ,,
Potassium bromide	40 ,,
Water	15 ounces.

Mix in equal proportions.

CHAPTER XVI.

Artistic Enlargements—On Methods of Control and the Use of Diffusing Screens.

The interest which is shown at the present time in pictorial photography, and the general desire for information and instruction as to the means which may be adopted in order to impart individuality to one's photographs and exercise the control which is so necessary a factor in the production of a pictorial rendering of any subject, induce me to take advantage of the opportunity afforded of specially devoting a chapter to this part of the subject.

Direct enlarging upon bromide paper affords special advantages to those photographers who desire to exercise personal control over their prints, and I think were these advantages more generally realised, bromide enlarging would be more often resorted to by such workers than it is at present.

The use of screens, either opaque or provided with apertures of suitable size during exposure, will afford opportunities for modifying the original effect to an almost unlimited extent. The possibilities of improving or altering the general tonality of the print, of

reducing contrast in one part by locally shading, or of increasing contrast in another by giving an auxiliary local exposure, are infinite. To expose locally, an opaque card with an aperture of suitable dimensions is employed, whilst to locally shade or keep back any particular portion of the enlargement, a disc of cardboard is attached to a wire, which is kept in gentle motion over the portion to which it is desired to give less exposure.

In adopting such methods the degree of improvement effected will, of course, depend upon the ability of the worker to recognise where the strengthening of a portion of the picture—or the subduing of some other portion—will enhance the general pictorial effect. Given the artistic mind and the capacity to recognise the improvement necessary, the carrying out of the technical details will present but little difficulty, the image during exposure being visible, and the effect of local treatment being at once apparent. Such methods, of course, will not be available if the enlargement is produced in an enlarging camera, but only when either the darkened room method or an ordinary enlarging lantern is employed.

It is often alleged against a bromide enlargement that there is something in the appearance of the image which is characteristic of the process, and which stamps the origin of the picture. I refer to the granularity or coarseness of image which sometimes greatly detracts from pictorial effect.

This appearance may be the result of various causes, chief among them being excessive magnification, forced development, or the use of too strong a developer. The character of the enlarged image is, of course, also largely influenced by the nature of the small original negative, and any undue tendency to granularity in the latter will be increased in the enlargement. Every effort should, therefore, be made to secure a negative of the character described in the chapter dealing specifically with that part of the subject. (Chapter VIII., *ante.)*

Granularity is more noticeable when the enlarged image has been very sharply focussed, and the simple expedient of throwing the image out of focus during a portion of the exposure will often cause the defect to disappear.

But undoubtedly the best method of effectually dealing with the difficulty is to adopt the plan of interposing in the path of the image bearing rays between the lens and easel a transparent screen of fine silk or muslin or other material of a diaphanous nature. The effect of such screens when properly used is often marvellous. I would emphasise the words "when properly used," because without proper precautions results quite the reverse of artistic may easily be produced.

In general, a negative that inclines to thinness is best suited for direct enlarging, but when a diffusing screen is used a stronger type of negative may

with advantage be employed, the screen tending to reduce contrast and produce a soft result. This fact is a valuable one to remember when, as sometimes happens, it becomes necessary to enlarge from a hard or over-dense negative.

The screens should be made of a fine quality of silk known as "Bolting Cloth," used, I believe, for sifting and preparing the finer qualities of flour. The material can be obtained in various degrees of fineness of mesh, and although other fabrics equally suitable could probably be found, its great evenness of texture makes it specially suitable for the purpose. A piece somewhat larger than the biggest enlargement that is intended to be made should be glued to a light wooden frame, special care being taken to avoid puckers or creases, which, of course, would show in the enlargement, and when not in use the frame should be kept in a paper bag or envelope.

In use the screen is interposed between the light and the projected image, and the slight diffusion thereby produced imparts a peculiar softness which is very artistic and pleasing, and quite removes the granular effect which is often complained of. The nearer the screen is placed to the enlarged image the less marked will the diffusion be, but the screen should not be allowed to remain in actual contact with the sensitive surface of the paper, because so doing will produce an effect somewhat similar to

that found in a print from a half-tone block—a consummation hardly to be desired. In practice, it will be found that the most pleasing results are to be obtained by first giving the enlargement half the normal exposure deemed necessary, capping the lens, and then completing the exposure with the screen interposed, keeping the latter in gentle movement. The latter is rather an important point, for I find that a more pleasing effect is secured when the screen is kept in motion than when it is allowed to remain stationary. It must be observed that the interposition of the screen increases the duration of exposure by about one-third, but the necessary amount can only be determined by actual trial, for it will largely depend upon the kind of rendering which it is desired to produce.

It must not, however, be supposed that the use of a diffusing screen will provide an antidote for all possible artistic shortcomings, but in the hands of those who are the possessors of the true artistic instinct (in the absence of which pictorial photography is an impossibility) it provides a valuable addition to the many useful devices which are perhaps more generally known.

Apart from, or rather in addition to, the methods of control to which reference has already been made, it is possible, by adopting the slow or tentative system of development, to still further modify the final result. To gain the full advan-

tage of this method the brush system is the best to adopt. After exposure, which should have been generous, the paper is soaked in clean water till thoroughly limp, and then developed in a weak and well-restrained developer until a faint image is fully developed. It should then be transferred to a large sheet of clean glass, and rested on supports, easel fashion, development being completed by applying a stronger developer with a large camel-hair brush. A plentiful supply of water should be at hand in order to arrest development at any moment when necessary. This system of brush development affords abundant scope for originality of treatment, and in conjunction with the other methods of local or general treatment enumerated above should enable the artistically-minded worker to produce almost any desired effect.

CHAPTER XVII.

The Making of Enlarged Negatives.

We have now to consider that which is undoubtedly the best of all enlarging methods, viz., the production of enlarged negatives. This process has several advantages over what I may call "direct" methods, in that it permits of the improvement of the original at different stages of the work, and the ultimate print may be produced by the process considered most suitable to the subject I have not the slightest hesitation in asserting that in the hands of a clever worker the enlargement will, in many cases, be an improvement on the original. I have experimented a great deal in this direction, and after a most careful comparison of prints from both direct and enlarged negatives I find that the latter, from an artistic point of view, are frequently to be preferred. I am, however, confining my criticism to matt-surfaced prints, and not to prints upon albumenised or gelatino-chloride papers. I am not going to assert that an enlarged negative is as pretty a thing to look at as one taken direct, or that there is invariably an entire absence of granularity, for, as a matter of fact, it would be, generally speaking, an easy matter to confute either statement. I

have, however, ceased to regard certain qualities, sometimes referred to as "bloom," "pluck," "clean glass shadows," and so on, as being the *ultima Thule* of photography, and have learnt to look upon the finished print as the reward for my labours. It is a fact well known to most of us, that sometimes our poorest *looking* negatives give the best results in the printing frame. The amount of granularity present in the enlarged negative will obviously vary considerably, and will depend upon the degree of amplification, the kind of plate used for taking the original negative, its rapidity, the manner in which it was developed, and the exposure given to it. Some plates show a much finer deposit on development than do others; but after a little experience the reader will quickly ascertain which plates are best suited to his purpose. If the finest obtainable results are desired, the degree of enlargement should not be very great. I find, in my own work, that enlarging to four times the size of the original, I get very little granularity in the enlarged negative, and not any in the print. It will often be possible to enlarge a negative four times, or two diameters, without showing granularity, when if the amplification were increased to four, or more, diameters, the amount of granularity produced might be very great. The best results will always be obtained when enlarging from negatives taken on slow plates which have received time exposures—in fact, the shorter the exposure and the more forced the

development the greater the amount of granularity likely to occur. In other words, a slow plate with a normal exposure and development means a fine deposit; and the converse conditions, namely, a rapid plate, short exposure, and forced development, a coarse deposit.

Focussing the enlarged image must be most carefully attended to, as upon it the definition of the enlarged negative will, in a great degree, depend. With some negatives, particularly such, for instance, as exhibit a large surface of foliage, it is difficult to see when a sharp focus has been obtained, more especially if the light should not be very bright. In such a case I make use of a special negative which I keep by me for the purpose. It is an architectural subject, with clear cut lines, thin and clean, and was developed with hydroquinone. With such a negative it is always easy to obtain a sharp focus. The camera is then clamped up, the test negative removed, and the negative to be enlarged inserted in its place.

Broadly speaking, there are two modes in ordinary use of producing an enlarged negative. By the first method a transparency is made by contact from the original small negative, which, when dry, is placed in the enlarging camera, and an enlarged negative in turn produced from it. The alternative method, and the one which I consider gives by far the finest results, is to make, in the first place, an enlarged transparency in the enlarging camera

from the small original negative, and from that print by contact an enlarged negative. I am convinced by numerous experiments that the latter method gives far more definition and gradation than the former, and it allows, moreover, greater scope for the exercise of the ingenuity of the skilful worker in retouching and improving both the positive and the negative.

In referring to the question of granularity I indicated, generally, the kind of negative that would be likely to produce the best result for enlarging purposes. Negatives taken specially with a view to their ultimate enlargement should, whenever practicable, receive a full exposure, and the development should not be carried so far as to block the high lights, a negative inclining to softness generally giving the best results. We have, however, very often to do the best we can with what we have got, and luckily it is in our power, in making an enlarged negative, to very much modify, or, if need be, entirely alter, the effect obtained from the original negative. For instance, supposing the small original produces a hard chalky print, by giving a full exposure to the transparency and modifying the developer so as to prevent contrast as far as possible, and adopting the same principle in printing the negative from the enlarged transparency, we shall find that we have ultimately obtained, in the resulting enlarged negative, an effect very different in character from the original negative. I do not find

that the colour of the original negative exercises any appreciable influence upon the character of the result, although for a long time I inclined to the opinion that the best effects were obtainable from negatives of a yellowish tinge which had been developed with plain pyro. In the case of a very thin negative a better result will be obtained if it be varnished at the back with ordinary negative varnish which has been slightly coloured with aurine.

For making the enlarged transparency, either an ordinary dry plate may be used or one specially prepared for transparency work. I think perhaps the best results are to be obtained on a transparency plate. I generally use, however, for this purpose an Ilford ordinary, and I am very well satisfied with the results I obtain from it. The exposure, of course, will vary with the lens aperture used, the aspect, the time of year, and the density of the negative, but I find with the above-named plates, and the lens stopped down to f/16, that with an average negative an exposure varying from twenty seconds to a minute is required. Whether a full exposure or a short-timed one will be most suitable to obtain the effect aimed at, the reader will have to determine for himself, bearing in mind the foregoing observations on the character of the negative to be enlarged.

For developing the transparency I find pyro more suitable than ferrous oxalate, in that it is more amenable to modification in the event of error of

judgment in exposing. Of course, the appearance of a transparency developed with pyro is not so good as one developed with ferrous oxalate, but for this purpose the transparency is only a means to an end, and utility must be considered before beauty. As it is sometimes necessary to keep the developer on the plate, or a portion of the plate, for a considerable time, I prefer to use one containing sodium sulphite, in order to avoid discoloration or staining.

The transparency, when washed and dried, can be carefully examined, and, if necessary, retouched. I am aware that this is a delicate subject with some people, but I confess that I have yet to be convinced of the immorality of rectifying, where it lies in the power of the photographer to do so, the shortcomings and failures of his process. At any rate, it is possible, for those who have no scruples of the nature referred to, to very considerably improve the transparency, and consequently the finished print, by a little judicious retouching. The appearance of the transparency may be taken as a guide to the effect which will be obtained in the ultimate print. We can, therefore, in any retouching which we may attempt, see the effect that we are producing as we progress. It is really wonderful the improvement that may be effected by just deepening a shadow or putting in a few details in a high light, and until a photographer has demonstrated this for himself he can have no idea of the power placed in his hands. The surface of the negative, where

retouching is necessary, must be prepared in order that the pencil may "bite," and as in most cases only local retouching will be required, the easiest mode of doing this is to rub the tip of the forefinger on a lump of resin until it feels "tacky," and then to rub the portion of the negative which is to be worked upon with a light circular motion. When the surplus resin has been dusted off, the negative will be in a fit condition for the pencil. Where a considerable area of the negative is to be retouched it will be better to apply one of the well-known retouching varnishes. Ordinary pencils of good quality may be used, and the most useful grades will be H, H H, and H H H, softer pencils being useless for the purpose. The negative should be laid upon a retouching desk, or, failing that, pressed against a window-pane, so that the effect of each stroke of the pencil may be noted.

But the power of controlling or modifying the result is by no means confined to the simple methods just referred to. As to the legitimacy or desirability of adopting further means to secure a definite effect, I prefer in a practical textbook to express no opinion, but in order to make its sphere of usefulness as large as possible, and also having regard to the fact that so many enquiries are being made for information upon matters of detail and technique pertaining to the exercise of control over the purely photographic and often untrue and inartistic effect

produced by the camera and lens, I have come to the conclusion that a useful purpose may be served by briefly referring to some of them.

The "dodging" of the transparency having been completed, all that remains to be done is to print a negative from it by contact. This may be readily accomplished by placing the transparency in a printing frame, putting an ordinary dry plate, or a special transparency plate, in contact with it, and making the exposure to artificial light. I find the exposure required by an Ilford ordinary, at a distance of six feet from a bat's-wing burner turned down rather low, is about four seconds, but this, of course, is only approximately correct. The development of the enlarged negative so obtained differs in no way from the treatment of an ordinary plate, and when fixed, washed, and dried, it is ready for printing from.

It is unnecessary to go in detail through the alternative method of making a small transparency by contact from the original negative, and from that producing the enlarged negative in the camera. The observations already made apply equally to both methods. I have previously expressed the opinion that the method first described produces the finest results, the only advantage of the latter mode of working being a slight saving in material, owing to the fact that a small plate, instead of a large one, is used for making the transparency.

CHAPTER XVIII.

Printing from the Enlarged Negative.—How to Sensitise Rough Papers, etc.—Conclusion.

Although contact printing does not come strictly within the province of this work, yet a few words on the subject appear to form a not unfitting conclusion to it. I do not intend to refer to the well-known processes of contact printing which are commonly practised by photographers, such as the platinotype, bromide, and carbon processes, any of which may be employed for printing from the enlarged negative; but I wish to direct particular attention to the less known, but far older, process of printing on rough-surfaced papers, sensitised with silver chloride, and toned with either platinum or gold. This process, I consider, allows the operator more scope for the exercise of taste and ability, in artistic directions, than any other, especially when rough Whatman paper is employed. This is due in a great measure to the fact that the rough, broken-up surface of the paper prevents any slight granularity which may exist in the enlarged negative from being reproduced in the print. If the reader elects to try this method of printing he will be compelled to prepare his own paper, for

he will not be able to obtain it commercially. Matt-surfaced paper of a smooth texture can, of course, be obtained, but I am referring to much rougher surfaces.

The home preparation of it, however, is neither tedious nor difficult, therefore considerations of that nature need not deter even the veriest tyro from making his own paper. The manipulations are few and simple, and consist of salting the paper, allowing it to dry, and then sensitising with a solution of silver nitrate. As I have previously said, I do not intend to go into minute details, and I shall content myself with giving a plain, practical description of my own method of working. Those who wish to study the matter more minutely will find all they require in the various text-books on photography.

The paper I use for printing from enlarged negatives is, as I have already indicated, of coarse texture, being, in fact, the very rough paper prepared by Whatman for painting upon in water colours, and which is obtainable at all artists' colourmen's for about 6d. a sheet. More expensive qualities can be obtained, and for large-sized pictures are to be preferred, as, being considerably thicker, they are less likely to tear. I would here remark that more care is necessary in manipulating these papers than when dealing with platinotype or bromide paper, for when wetted they become very liable to tear; indeed, the weight of a wet print in lifting it from one solution to another is enough, unless care be exercised, to cause the paper to tear.

The salting of the paper I perform in the following way: Weigh out and put in a clean gallipot (by-the-way, if this has to be procured from the household authorities, freedom from any suspicion of grease, which would be fatal to success, should be secured by washing it in hot water and soda) twenty grains of Nelson's gelatine—I use the sixpenny packets obtainable from the grocer—upon this pour half-a-pint of cold water, and stand by for an hour to allow the gelatine to swell, then add one and a half drams of common salt, put the whole upon the stove and dissolve by gentle heat, well stirring the mixture with a clean fork at frequent intervals. The paper to be salted should be cut up into pieces slightly larger in dimensions than the size of the enlarged negatives which are to be printed from, so as to allow for cutting off the margins, the sensitising at the edges of the sheet being generally unequal, the salting and sensitising fluids having a tendency to collect there. I use a modification of the Blanchard brush. I take a piece of celluloid and a piece of rough, clean flannel of similar dimensions, and double them over and retain them in that position by the aid of a wooden clip. The gelatinised salting solution must be applied evenly, and care should be taken not to allow it to get on the back, or patchy prints will result. The solution should be kept hot while in use, as if allowed to get cool, bubbles are formed

by the action of brushing over the paper which would show distinctly in the finished print. The paper after coating may be allowed to dry spontaneously, or by heat, that is to say, it may be held in front of a fire or over a gas jet or a lamp. In its salted condition it will keep for any time, and is, of course, unaffected by light.

In order to sensitise it it is brushed over with a brush made as before described with the following solution: Dissolve one hundred grains of citric acid in two ounces of water, and two hundred and forty grains of silver nitrate in another two ounces of water. The two solutions are mixed and form the sensitising solution. The solution will keep good for a long time, and I find that paper coated with it, if kept between blotting paper under pressure, will keep at least a month in cool weather, but I prefer to prepare the paper freshly. Care must be taken to use a sufficient quantity of silver solution, and to see that the whole sheet is covered. The solution must, in fact, be well brushed in, otherwise insensitive patches may result, owing to the repellent nature of the paper preventing the absorption of the solution.* The paper after sensitising may be allowed to dry spontaneously, or it may be dried by holding it over a gas flame, precaution being taken to prevent it from scorching. When dry the paper

* NOTE.—I find, after further experimenting, that both solutions can be better and more effectively applied by means of an ordinary hog-hair painter's brush than with the one above referred to.

is ready for printing. It should be borne in mind that paper so prepared is far more rich in silver than commercial sensitised paper, therefore all negatives should be properly varnished in order to avoid silver stains, which are almost impossible to remove, and would spoil the printing qualities of the negative. A rather vigorous negative seems to give the best results with this process, and proofs must be rather over-printed, as the reduction in the toning bath, particularly if dark tones are desired, is considerable.

Either platinum or a gold toning bath may be used. I generally employ the latter, as it is much cheaper, and the results are very similar to those obtained with platinum. I find, however, that the following modification gives better results than the gold baths in ordinary use: Dissolve in twelve ounces of hot water twenty grains of sodium acetate and ten of sodium phosphate; when cool, add one grain of gold chloride; the solution is then ready for use. The prints must be washed before toning to get rid of the free chloride. They will be found to tone very rapidly, and if warm tones are desired care must be taken not to allow the toning action to proceed too far. It will be found better to tone by diffused daylight than by artificial light, as the colour can be more readily judged, and, if possible, a wasted print should be toned first, as very often the first print placed in the bath tones unevenly. Fixing is performed in a solution of

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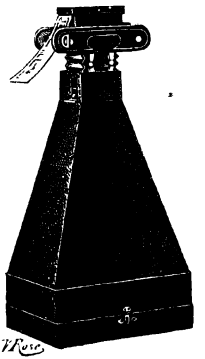

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